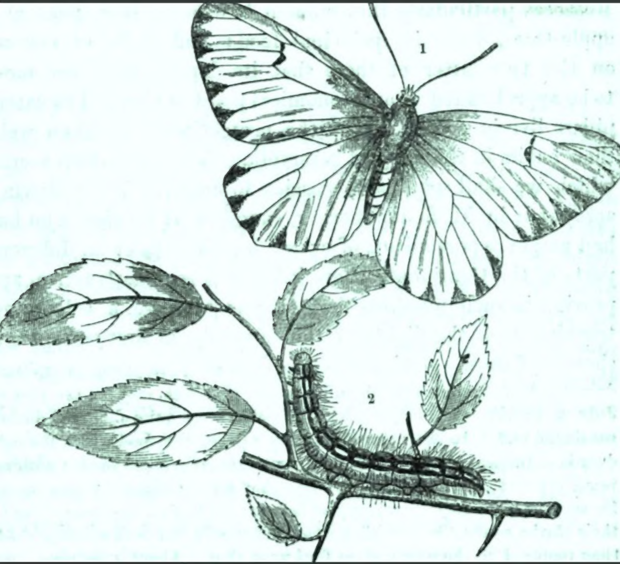

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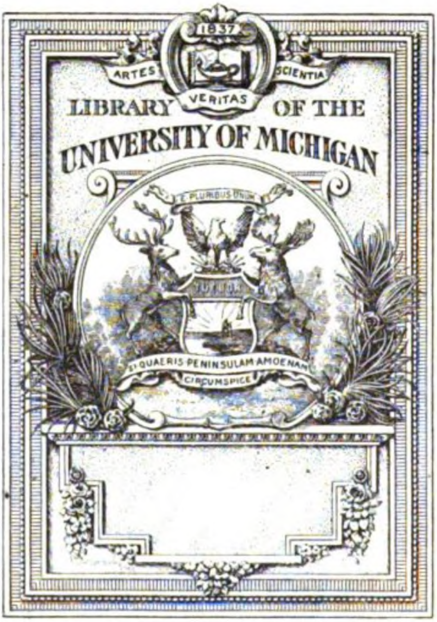
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THE

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JOURNAL OF AGRICULTURE.

THE ORGANIC CHEMISTRY OF THE EIGHTEENTH CENTURY.

By CUTHBERT W. JOHNSON, Esq. F.R.S., Corresponding Member of the Maryland Horticultural Society.

In examining with attention the services rendered to the cultivators of the earth by some of the great men of science who adorned the middle and latter portions of the eighteenth century, we can clearly perceive the dawnings of a brighter day to have commenced; and if, in proceeding through the works of such men as Evelyn and Boyle, we find but slight evidence of any very correct reasonings upon the chemistry of vegetation, yet still we must remember that when these two great men existed, they were in ignorance of almost all the chemical facts of which many after-labourers in the same field had the advantage. Yet notwithstanding all these obstacles to the acquisition of knowledge, even they felt the importance of the union of "science with practice," and they had, undoubtedly, the great merit of first drawing the attention of the chemist to an unexplored field, which Priestley and other chemical philosophers afterwards examined more minutely and with far better success. I propose in this paper to follow this quiet, this noble progress of Organic Chemistry through this important period of its history, and to examine so much of the works of Evelyn, Boyle, and Priestley, as either relate directly to the vegetable world, or to the first germs, as it were, of the science of vegetable chemistry.

John Evelyn is the oldest of the three authors I have named. He was born in 1620. Of this excellent person, honest Switzer enthusiastically observes that he "was appointed for retrieving the calamities of England, and reanimating the spirit of his countrymen, for the planting and sowing of woods;—to him it is owing that gardening can speak proper English." Evelyn, according to Mr G.W. Johnson,* died at Wotton, February 27, 1705, after a life of unwearied utility, regretted by every man of science and by every patriot. His writings and example were of the greatest service in promoting the arts of cultivation. His family, it appears, delighted in the same pursuits as he did himself. "There is," says D'Israeli, "What may be termed a family genius in the home of a man of genius. He diffuses an electrical atmosphere; his own pre-eminence strikes out talents in all. Evelyn, in his beautiful retreat at Sayes Court, had inspired his family with that variety of tastes which he himself was spreading throughout the nation. His son translated 'Rapin's Gardens;' which poem his father preserved in his 'Sylva.' His wife, ever busied in his study, excelled in the arts her husband loved, and designed the frontispiece to his 'Lucretius.' She was also the cultivator of their celebrated garden, which served as an example of his great work on forest trees."† It is of this work, and of his "Pomona" and "Terra," that I shall chiefly remark in this paper.

Evelyn was one of the early members and warm supporters of the Royal Society, through the first volumes of whose Transactions several of his papers are distributed. He was ever on the watch to aid and elevate the cultivators of the soil. Long before the great Jethro Tull advocated the importance of the drill, Evelyn had seen its importance; for, in one of his papers, dated in February 1669,‡ he urged upon the attention of the agriculturists of his day the advantages possessed by a drill plough, which, first invented in Germany, had from thence been introduced at Madrid under the auspices of the Spanish monarch, and had been forwarded to this country from Spain by the English ambassador, the Earl of Sandwich, as the invention of a Don Leucatilla. It is there described by him as "the Spanish Sembrador, or new engine for ploughing and equal sowing all sorts of grain, and harrowing at once." Leucatilla saw very clearly the disadvantages of the broadcast system. He observed—"*Even at this day* (1669) all sorts of seeds are sown by handfulls, heedlessly and by chance, whence we see corn sowed in some places too thick and in others too thin." After a lapse of two centuries, it would be well if the use of this valuable machine was more general, and that not only of the common seed, but the manure-drill, an implement which, far too little appreciated by the farmer, is not yet employed to one-tenth the extent of which it is capable.

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* Hist. of Gard., p. 104. † D'Israeli, Literary Charac., 232.

‡ Trans. Roy. Soc. vol. v., p. 1056.

The period when Evelyn addressed the newly formed Royal Society upon the important subject of plantations of timber trees, in the memorable discourse which formed the groundwork of his "Sylva," was very appropriate for the noble effort he thus made. England had just escaped from the troubled times of the usurpation. Lands had too rapidly changed hands at that period for the improvement of the soil; the neglect of the old woodlands had become universal, and new plantations were hardly thought of, for what the owners held by so fragile a title they could hardly feel secure of possessing for the requisite period for a profitable return from young plantations of timber. Evelyn alludes to these circumstances in his preface, when he asks of the reader—"But what shall I say, then, of our late prodigious spoilers, whose furious devastations of so many goodly woods and forests have left an infamy on their names and memories not quickly to be forgotten—I mean our unhappy usurpers and injurious sequestators? Not here to mention the deplorable necessities of a gallant and loyal gentry, who, for their compositions, were (many of them) compelled to add yet to this waste by an inhumane and unparalleled tyranny over them to preserve the poor remainder of their fortunes, and to find them bread."

With these feelings Evelyn wrote his celebrated work on timber trees, which he entitled "Sylva, or a discourse on forest trees, and of the propagation of timber trees in his Majesty's dominions." The dedication, which is dated from Sayes Court, May 29, 1663, is to the profligate Charles the Second, in which he correctly told him "that no jewel in his crown could render him so much lustre and glory, as his regard to navigation, and to one main support of it, the woods and forests of his country."

The work itself is very valuable; it contains many truths and wise observations, which it were well if modern planters more generally acted upon. He was fully aware of the importance of noticing the situations most proper for timber trees. He says,—"To observe the *coast* and side of the stock (especially of fruit trees) is not such a trifle as by some pretended; for, if the *air* be as much the mother or nurse as *water* and earth (as more than probable it is), such blossoming plants as court the motion of the meridian sun, do, as it were, evidently point out the advantage they receive by their position, and the frequent mossiness of most trees on the opposite side, does sufficiently note the unkindness of that aspect:" and he adds in another place, "There are other rules concerning the situation of trees, some commending the north-east wind, both for the flourishing of the tree and advantage of the timber, but to my observation in our climates, where those sharp winds do rather flanker than blow fully opposite upon our plantations, they thrive best:" and again he notes, "The timber is commonly better qualified which hath endured the older aspects; and hence it is that Seneca observes woods most exposed to the winds to be the most strong and solid, and that, therefore, Chiron made Achilles' spear of a mountain tree, and of those the best which grew thin, not much sheltered from the north."

That the transplanting of large timber trees had been successfully attempted in Evelyn's time, he bears abundant testimony. He says, p. 13, "Concerning the transplanting of great trees, and to shew what is possible to be effected in this kind with wit and industry: Count Maurice (the late governor of the Brazil), planted a grove near to his delicious paradise of Fribourg, containing six hundred coco-trees of eighty years' growth, and fifty feet high to the nearest bough; these he wafted upon floats and engines four long miles, and planted them so luckily, that they bare abundantly the first year. Nor hath this only succeeded in the Indies alone; M. de Fiat, one of the Marshalls of France, hath with huge oaks done the like at de Fiat. Shall I yet bring you nearer home? My Lord Hopton planted oaks as big as twelve oxen could draw, to supply some defect in an avenue to one of his houses in Devonshire."

Evelyn did not omit to warn the owners of woods to be careful in fencing them. "One skilful and diligent man," he observes, "will govern five hundred acres; but if, through any accident, a beast shall break into his master's field, or the wicked hunters make a gap for their dogs and horses, what a clamour is there made for the disturbance of a year's crop, at most in a little corn. Whiles abandoning his young woods all this time, and perhaps many years, to the venomous bitings and treadings of cattle, and other like injuries (for want of due care), the detriment is many times irreparable: young trees once cropped hardly ever recovering. It is the bane of all our most hopeful timber; but shall I provoke you with an instance? A kinsman of mine has a wood of more than sixty years' standing; it was, before he purchased it, exposed and abandoned to the cattle for divers years, some of the outward skirts were nothing save shrubs and miserable starvlings; yet still the place had a disposition to grow woody, but by this neglect continually suppressed. The industrious gentleman has fenced in some acres of this, and cut all close to the ground; it is come, in eight or nine years, to be better worth than the wood of sixty, and will, in time, prove most incomparable timber, whilst the other part, so many years advanced, shall never recover, and all this from no other cause than preserving it fenced: judge, then, by this our own woods come to be so descried; are five hundred sheep worthy of the care of a shepherd? and are not five thousand oaks worth the fencing and the inspection of the hayward?" He gives copious and minute directions for the construction of fences, and recommends even the use of the furze for this purpose. "Would you believe (writes a witty correspondent of mine) that in Herefordshire (famous for plenty of wood), their thickets of furzes should yield them more profit than a like quantity of the best wheat land of England, for such is theirs? No provender makes horses so hardy as the young tops of these furzes, no other wood so thick, nor more excellent fuel, and a great refuge for fowl and other game."

The Sylva is not a mere general argument to induce the national cultivation of timber, it is a plain practical forester's *vade mecum*, treating, in separate articles, of each forest tree, from the oak to the alder,—their seed-sowing,—and their nurseries' diseases,—pruning and felling,—and at large upon their management. For instance, he says, when speaking of copses,—"As to what numbers and scantlings you are to leave on every acre, the statutes are our general guides, at least the legal. It is a very ordinary copse which will not afford three or four firsts, that is bests; fourteen seconds; twelve thirds; eight wavers; and, according to which proportion, the sizes of young trees, in copsing, are to succeed one another. By the statute of 35th Hen. VIII., in copses or underwoods felled at twenty-four years' growth, there were to be left twelve standils or stones of oak upon each acre, in defect of so many oaks, same number elms, ash, asp, or beech, and they to be of such as are likely trees for timber."

At the end of Evelyn's Sylva is printed his "Pomona, or an Appendix concerning Fruit-Trees, in relation to Cider, the making and several ways of ordering it." When once Evelyn undertook to plead the cause of cider, it was certain that he would not be a compromising advocate; thus he tells us in his very preface, that "it was by the plain industry of one Harris (a fruiterer to King Henry the Eighth), that the fields and environs of about thirty towns in Kent only, were planted with fruit to the universal benefit and general improvement of that county to this day; as, by the noble example of Lord Scudamore and others, all Herefordshire is become, in a manner, but one entire orchard. And when his Majesty shall once be pleased to command the planting but of some acres, for the best cider fruit at every one of his royal mansions, amongst other of his most laudable magnificences, his subjects will (doubtless) follow the example, till the preference of cider, wholesome and more natural drinks do quite vanquish hopps, and banish all other drogues of that nature."

In this work, as in his Sylva, Evelyn proceeds to examine his subject with all the gravity of a philosopher. He begins with the nursery, or, as he calls it, the seminary; then has chapters on stocks, grafts, and incisions; of variety, and improvements of the place and order; of transplanting and distance; of fencing and of pruning; and, lastly, he adds "Aphorisms concerning Cider, by Dr Beale," and Sir Paul Neile's "Discourse of Cider," and another by Mr Newburgh; all abounding in plain practical advice, and giving directions which are now pretty generally followed in the cider-producing districts of England.

Evelyn was a gardener too. The gardens at Sayes Court were, in his time, kept in the nicest order. It was here that Peter the Great of Russia resided when he paid his visit to this country, and it was here that he amused himself by driving wheel-barrows over its valuable borders, or by being wheeled in them over the box-trees, by his attendant equally uncivilized boors.

Evelyn tells us in his preface, that "as Paradise (though of God's own planting) had not been Paradise longer than the man was put into it, to dress it and to keep it so: there is not amongst men a more laborious life than is that of a good gardener's, but a labour full of tranquillity, and satisfaction, natural, and instructive, and such as (if any) contributes to piety, and contemplation, experience, health, and longevity. In sum, as a condition, it is furnished with the most innocent, laudable, and purest of earthly facilities, and such as does certainly make the nearest approaches to that blessed state where only they enjoy all things without pains." His "Kalendarium Hortense" gives the ordinary monthly directions commonly given in gardeners' calendars of work to be done "in the orchard and ollitory ground," "in the parterre and flower-garden," and a list of "fruits and flowers in prime, and yet lasting." Such a list of two centuries since may be interesting to a modern gardener. Evelyn's calendar for September contains many names unknown to the fruit growers of our age;—of apples he enumerates ten varieties, the Bellebonne, the William, Summer Pearmain, Lording Apple, Pear Apple, Quince Apple, Redgreening Ribbed, Bloody Pepin, Harvey, and the Violet Apple;—of pears he names, Hampden's Bergamot, Summer Bon Chrestien, Norwich, Black Worcester (baking), Greenfield, Orange, Bergamot, the Queen-Hedge Pear, Lewes' Pear (to dry excellent), Frith Pear, Arundel Pear (baking), Brunswick Pear, Winter Poppering, Bing's Pear, Bishop's Pear (baking), Diego, Emperor's Pear, Chester Pear, Messire Jean, Rowling Pear, Balsam Pear, Bery d'Hery;—Melacoton Peaches, Almonds, Quinces, and Berberries;—of grapes, the Little Blue, Muscadine, Frontiniac, Parsley, Great Blew, and the Verjuice;—of the flowers, they are chiefly the ordinary kinds still cultivated in our gardens;—"and to these," he observes, in conclusion, "might some others be added, but we conceive them sufficient, and more than, we fear, some envious and mercenary gardeners will thank us for."

Evelyn also published, in 1676, a very elaborate work on earth; it was entitled "Terra, a Philosophical Discourse on Earth, relating to the Culture and Improvement of it for Vegetation and the Propagation of Plants, as it was presented to the Royal Society." This was reprinted with his Pomona, &c., in 1676–78, 12mo; and 1706, folio. Dr Hunter published it with notes and illustrations with the Sylva, in 1786, previous to which he had published it separately, in 1778, 8vo; and in 1786, 4to.

In this work Evelyn lauds the powers of earth in every possible way. Jethro Tull did not think more highly of its unaided virtues. If the Greek philosophers deemed earth to be one of the four elements of all bodies, Evelyn seems quite as inclined to believe it capable of performing any part, however extensive, in the economy of Nature. "What shall I say," he exclaims, "Quid Divinum? the original of all fecundity; nor can I say less, since there was formerly no sacrifice nor discourse acceptable without it;" and in another place he says, when alluding to the services of earth to vegetation (for

Evelyn was exceedingly credulous)," Whatever then it be which the earth contributes, or whether it contains universally a seminal virtue, so specified by the air, influences, and the genius of the climate, as to make that a cinnamon-tree in Ceylon which is but a bay in England, is past my skill to determine, but it is to be observed what Mr Bernier, in his History of the Empire of Mogul, affirms to us of a mountain there, which being one side of it intolerably hot, produces Indian plants, and on the other as intemperately cold, European and vulgar plants."

There is much valuable matter dispersed throughout Evelyn's Terra, whose modesty, too, enhanced his great merits. Thus, in conclusion, he told the Fellows of the Royal Society, to whom his valuable essay was addressed, that it was merely "a dull discourse of earth, mould, and soil."

In this elaborate work Evelyn exhausted all the science of his day, and brought together the great mass of observations he had long industriously collected. Its object was not merely an account of earth, or rather soils, but of the mode of improving it, both by fallowing, mixtures of different varieties of earth, and manuring,—upon which branches of his theme he is far more copious than any author who had preceded him. At p. 18 (I use the edition of Evelyn's works of 1825, in 3 vols. 4to, by Dr Hunter), he gives a list of the various plants which tenant particular soils. He says,—" Another infallible indication of the kind of soil is the nature and floridness of the plants which the land naturally produces, as where thistles spontaneously thrive,—where the oak grows tall and spreading, and as the plant is of kind so to prognosticate for what tillage or other use the ground is proper. Thyme, strawberries, betory, and sorrell, direct to wood; chamomille to a mould disposed for corn; and hortulan, culture; burnet to pasture; mallows to roots," &c.

He examined (p. 16) through a microscope, with much care, all kinds of earths and manures, but his discoveries, as might reasonably have been anticipated, were, by such a mode of proceeding, neither numerous or important. His views of the advantages of increasing the depth of soils, and of the best mode of planting trees, were excellent. He says,—" It is in the mean time wonderful to consider how such vast, tall, and monstrous trees as firs, pines, and other alpestrals (whose footing and roots insinuate into the most dry and impenetrable rocks, without any earth or mould to nourish them) can grow, exposed as they are to the most rigid colds, fierce winds, and other inclemencies of weather, if the rains, dews, mists, the air, or other visible principle, appear in no proportion to the stature, bulk, and substance of these goodly trees. These, indeed, with many other queries, do appositely come in here; but it would, perhaps, render this discourse more prolix than useful to enter upon them in detail; nor is it for me to undertake speculations of so abstruse a nature, without unpardonable ostentation; and, therefore, having only offered something towards the discovery of the great varieties and choices of earths (such as we gardeners and rustics, for the most part, meet with in our grounds), my next endeavour shall be to show how we may improve the best, and prescribe remedy for the worst, by labour and stirring only, which, being the least artificial, approaches the nearest to nature. At the first breaking up of your ground, therefore, let there be a pretty deep trench or furrow made throughout, of competent depth (as is the manner of experienced gardeners), the turf being first pared off and laid by itself, with the first mould lying under it, and that of the next in succession, that so they may both participate of the air, showers, and influences to which they are exposed; and this is to be done in severals, as deep as you think fit, that is, so far as you find the earth well-natured; or you may fling it up in several small mounds or lumps, suffering the frosts and snows of a winter or two (according as the nature of it seems to require) to pass upon them, beginning your work about the commencement of autumn, before the mould becomes too ponderous and sluggish; though some there are who choose an earlier season, and open their ground when the sun approaches, not when he retires; but certainly to have the whole winter before us, does best temper and prepare it for those impregnating agents.

"In separating the surface-mould from the deeper, whether you make a trench or dig holes to plant your trees in, be it for standards, espaliers, or shrubs, the longer you expose it and leave the receptacles open (were it for two whole winters), the better it will recompense your expectation; and especially, if, when you come to plant, you dispose of the best and fattest earth at the bottom, which, if it be of sweet and ventilated mud of pond or highway dust, were preferable to all the artificial composts you can devise. In defect of this (where it cannot be had in quantity), cast in the upper turf, if not already consumed, the sod downwards, with the next adhering mould for half a foot in thickness; on this a layer of well-manured dung, then as much of the earth as was which was last flung out, mixing them very well together. Repeat this process for kinds, mixture, and thickness, till your trenches and holes be filled four or five inches above the level or area of the ground, to which it will quickly subside upon the first refreshings, and a very gentle treading to establish the tree. Fruit planted in such mould, you will find to prosper infinitely better than where young trees are clapped in at adventure in new broken-up earth, which is always cold and sluggish, and ill complexioned; nor will they require (as else they do) to be supplied every foot with fresh soil, before they are able to put forth lusty and spreading roots: but which it is impossible to convey to them so as to affect the under parts, by excavating the ground and undermining the trees, after once they arrive to any stature, without much trouble and inconvenience, and the manifest retarding of their progress.

"If you will plant in pits and holes, and not give your ground an uniform trenching (which I prefer), make them the larger; five feet, at the least, square, but not above half a yard or two feet deep, according to the nature of the tree. In dressing the roots, be as sparing as possible of the fibres, small and tender strings (which are, as it were, the emulgent veins which insume and convey the nourishment to the whole tree), and such of the stronger and more confirmed parts which you trim, cut sloping, so as the wound may best apply to the earth."—(pp. 24-6.)

Evelyn was evidently of opinion, that the atmospheric air exercises a very considerable influence not only upon the earth, but upon the plants which it supports; in what that influence consisted, puzzled him as much as it did all preceding philosophers. He observes,—"What high and sublime things are spoken more upon this I forbear to prosecute; but in Sir Kenelm Digby's Discourse of Sympathetic Powder, he affirms that the earth, in the years of repose, recovers its vigour by the attraction of the vital spirits which it receives from the air and those superior irradiations which endow simple earth with qualities promoting fermentation. And, indeed, such a vegetative activity I have often observed in the bare exposure of some plants, but for a few hours only, as has raised my admiration, particularly in the aloe and other kinds of sedums, which, when to all appearance shrunk and shrivelled up, have filled themselves in a moment, set out in the air, when a very few drops of water (at the time, that is winter time) would certainly have made them rot and turn to a mucilage, as to my cost I have experienced. And these ferments of the earth, by this amity and genial intercourse with the air, are innumerable, to concoct, digest, accelerate, and restore, equal to one year beyond any artificial enforcements of dungs and composts whatsoever. But to return to dust again. By the toil we have mentioned, it is found that soil may be so strangely altered from its former nature, as to render the harsh and most uncivil clay obsequious to the husbandman, and to bring forth fruits and plants which otherwise require the lightest and hollowest moulds."—(p. 31.)

He treats of the improvement of sandy soils, marls, and chalks, at much length, and when speaking of clay soils, he told the farmers of his day,—"Clay is, of all other, a cursed stepdame to almost all vegetation, as having few or no meatuses for the percolation of the alimental showers, or expansion of the roots; whether it be the voracious, hungry, weeping, or cold sort. In these cases laxatives are to be prescribed, such as drift-sand, small gritty gravel, saw-dust, with marl or chalk, and continually vexing it with the spade or plough, but above all with sea-sand, when it may be procured, and the burning of the ground to ashes, with all that it bears, the more the better; for, by no less severity will this ill-natured mould be subdued. Rottenwood, and the bottom of bavine stacks, is a good ingredient to this manure; and if the land be of a cold and wet quality, strewings of soot is good; if very stiff, rubbish of brick, limestone, and such trash may be laid at the bottom, and on the upper part composts of dung; for, otherwise no limings (which being slecked is raw and cold), may, at any hand be applied, especially to the hungry sort, which (as also most kinds of marsh-earth), is subject to chasm, and gapes in dry seasons, to prevent which, a discreet mixture of ashes and sand is used; for, if it be in excess, it overheats the latter."—(p. 38.)

Of the advantages to be derived from mixtures of various organic matters with earth our author was fully aware, he says, —"Earth is also sometimes improved by mixtures of fern, rotten leaves, and the poriture of old wood, the haulm of beans, peas, and other legumina, which heat and accelerate concoction; for which, and all other medications, the nature of the mould is carefully to be examined, that application be made accordingly; as, for instance, if it be sandy, or other light-mixed earth, to embody it with something of a fatter nature, as lime or marl (for I yet forbear the touch of ordure or animal composts, as the least natural), and be sure so to stir and lay it (especially if lime) that it may not sink too deep and suddenly, as it is apt to do, and so desert the surface-mould, where it should do the feat, and therefore it is to be the oftener renewed. But marl enters as properly here, and so does mud, slub of slimy waters, especially if the soil be gravelly and mixed, which it will sadden and impingnate, and consequently bind; but, if the gravel be wet and cold, lime is preferable: wherefore, the nature of the mould should be well examined before the application; as here, arenous and sandy earth want ligature, and, besides consisting of sharp and asperous angles, wounds, and galls, curbs and dwarfs our plants without extraordinary help to render the passages more slippery and easy; therefore, relenting chalk, or chalk-marl, is also profitable, with calcinations of turf, or sea-wreck, where it is at hand; and if the soil be exceedingly bibulous, spread a layer or couch of loam, discreetly mingled at the bottom, to entertain the moisture. In the meantime, there are yet some plants which thrive almost in nothing so well as in sand alone, or with very little mixture, nor that of any dung; so melons are said to grow in Jamaica, and some vast timber trees have little or no mould adhering to their roots; such is that beautiful stranger the Japan lily, called by those of Guernsey (from whence we only have them) *La Belle de nuit*; and a certain palm of the same Japan which shrinks and dries at the least touch of water, as if it were laid before the fire, which is, it seems, the only remedy that restores it, or the sudden replanting it in scales of iron, or the most burning sand."—(p. 33.)

Living as Evelyn did, half a century before Jethro Tull, he anticipated that great farmer in his too enthusiastic opinions with regard to the advantages of pulverizing the soil, and, like Tull, he suffered his imagination to carry him much too far, when he thus spoke of the effects of mere mechanical operations in fertilizing the soil.

"Take of the most barren earth you can find, drained if you please of all its nitrous salts and masculine parts, reduce it to a fine powder (which may be done even in large proportion, by a rude engine, letting fall a kind of hammer or butte, at the motion of a wheel); let this pulverized earth, and for the time incessantly agitated, be exposed, for a summer and winter to the vicissitudes and changes of the seasons and influences of heaven; by this labour and rest from vegetation, you will find it will have obtained such a generous and masculine pregnancy within that period, as to make good your highest expectations."—(p. 30.)

Of the fertilizing powers of the saline matters of the soil, Evelyn speaks with much more correctness; but we must remember that when he thus spoke of saline matters, he rather intended the soluble matters of the soil, than of such substances as the carbonate of potash, phosphate of lime, and other salts of modern chemists. In spite, however, of these drawbacks, Evelyn was not far from the truth when he said,—

"It is salts which entice roots to effect the upper and saline surface of the earth, upon which the nitrous rains and dews descend, and the cause, that some plants, the most racy, and charged with juice, of all other (for such is the pine) thrive so well among rocks and pumices, and in whatever best maintains this vital pickle. It is salt which makes all covered and long-shaded earths to abound in fertility, and renders the dung of pigeons, poultry, and other salacious corn-fed birds, so eminently effectual before the soil of horses and other beasts, in which it less abounds, as having less virtue to attract it. It is salt that gives such vigour to places sprinkled with urine, soot, ashes, &c., which have them not diluted; and to bones, flesh, horn, hair, feathers, blood, and the rest of those animal excrements. And whence those seminal masses should proceed after calcination of the earth, when it comes to be exposed again, is hard to divine; whence, I say, they should derive their life and energy, without being destroyed by so powerful an agent as fire, unless they lurk in some vegetant and indissoluble salts (volatile, fixed, or nitrous earth) from whence they (phœnix-like) emerge, though I do not say without any other specific rudiment; but it is strange what, as I remember, Dr Morrison affirms of the *Erysimum* or *Iris*, so seldom seen to grow spontaneously in England before the late prodigious conflagration of this city, when there appeared more of it amongst the ruins than was known to grow in all Europe besides, it being a curious exotic, to be found most about Naples in the time of Fabius Columna, and but rarely elsewhere. It is salt which resuscitates the dead and mortified earth, when, languishing and spent by indulgence to her verdant offspring, her vigour seems to be quite exhausted, as appears by the rains and showers which gently melt into her bosom what we apply to it, and for which cause all our composts are so studiously made of substances which most engender or attract it.

"It is salt which fertilizes and renders Egypt so luxuriously fruitful after the inundations of the Nile; and the nitrous grounds of Jamaica and other places cause a stupendous growth of plants and trees.

"It is the want of salt which emasculates the virtue of seeds too long macerated in hungry water, and renders floated wood such unprofitable fuel, and to turn into such insipid ashes; and whatsoever it be some plants may appear to affect, as to the external differences of appetite, some of them seeming to draw in more air, some earth, and others water in extraordinary measure, according to the several contextures of their parts, or by whatever magnetisms and attractives, it is still to come at their salts, which doubtless create that inclination, and compose the various saps and juices which they present us. Nay, what if I should say that all the several parts of vegetables were endowed with their peculiar and distinct salts, through different motions, complications, and percolations? Or that so many earths, so many kinds of salts digested and transported by their different vehicles and strainers; and those also, though unlike in quality, yet perfectly congruous to what they produce and nourish? But what this vehicle or menstruum is, I contend not. It is evident that salts unite best with water, vernal and autumnal showers and dews, as the most apt to convey their insinuations. You know who have dignified salt with the prerogative of being named element-earth, the vigour and close of all things; yea, the first and last of elementated bodies. What shall I say, *quid divinum!* the original of all fecundity; nor can I say less, since there was no sacrifice or discourse without it. And verily, upon serious contemplation of the premises, and the little experience I have had of their effects in this work of vegetation, as far as I am able to penetrate into causes by them, I am not displeased at the magnificent epithets which are given it. In the mean time, I know there be who are so averse to this doctrine, as to prefer water alone before it; nor contend I with them, so they allow the near affinity and friendship which is between them, as I have deduced it at the entry of this discourse, where I describe my antoptical observations of the several earths; all that I pretend from hence being only to excite us to make diligent inquiry what may more likely be the cause of vegetation, and whether salt have not a dominion almost mechanical in this great work of Nature, being so absolute an ingredient in all our dungs and composts. I cannot in the mean time but wonder how a thing so eminently sacred and fertile should come to be the symbol of malediction; when, as the custom was, they used to sow salt in the place of cities they had erased and cursed; there being in all Nature nothing so pregnant and fruitful, unless it were to invite the plough to go there, and that the fertility of the spot for corn and grain might divert them from rebuilding and covering it again with houses. Indeed, to apply salts in excess burns the earth for a time, so as nothing will grow upon it; but, when once the rains have well diluted it, vegetables spring up more wantonly than ever. This I daily find, by sifting common salt upon the gravel walks of my garden, and for which cause I have left it off; and we find that the earth itself overwashed, and too highly manured, is as unprofitable as if it were barren for the time, and that there is in all things a just proportion to be observed."—(pp. 49–52.)

Evelyn, in common with every well-regulated mind, evidently delighted in watching the habits of plants, and marking the different varieties of food the most suitable to each. He observes, p. 68:—" Gardeners should sometimes humour their plants, cook and dress their food to their appetite, and as they can well digest; but by no means suffer the roots of fruit-trees, standards or mural, to be planted in dunged earth, which is not exceedingly well digested, and little different from the natural soil. For other rarer shrubs and plants—the orange thrives well with the ashes of burnt gourds and leaves; the red rose, capers, samphire, and other shrubs and plants, thrive better in gravel and rubbish; sage loves ashes, and purslane delights in dust and sweepings; rue effects the dry mould, lettuce the moister; flowers for the most part detest the dunghill, but if they love any it is that of sheep or cows, mixed with loam and light earth; tulips delight in change; the iris loves the dry bed; crocus a mixed rich and light soil; carnations desire a loamy earth, qualified, if too stiff, with sea-sand and sheep-dung; so also the peony, anemony, ranunculus, and other flowers. But if you would indeed be provided with excellent earth to plant most flowers in, lay turf of pasture grounds in heaps for two winters, till it be perfectly consumed. This is also admirable for all tuberose roots." He was aware of the fertilizing effects of saltpetre. This, however, he directs to be used in solution, p. 77:—" Infuse three pounds of nitre in fifteen gallons of water; with this irrigate your barren mould. This was successfully tried amongst tulips and bulbs, where the earth should by no means be forced by composts;" and of these facts, he says, they are " not transcribed out of common receipt-books, but most of them experimented."

Of the various organic manures Evelyn speaks with very considerable exactness. He mentions horse-dung, " the least pinguid and fat of any, being the most fiery;" of that of " that dull animal" the ass, " highly esteemed, as being well digested;" of cows and oxen, " of all other the most harmless;" of sheep-dung, " as of a middle temper between that and pigeons, profitable in cold grounds, and to impregnate liquors, of choice use in the garden." Pigs' dung he deemed " the coldest, and least acrimonious;" pigeons dung and that of poultry (especially of aquatic fowls, which is too fiery), " being full of volatile salts, is hot and burning." He treats also of carrion, urine " spirituous and sharp," hair, horn, bones, skins, leather, fish, refuse, grape skins, leaves of trees, duck-weed, saw-dust, rotten wood, wood-ashes, malt dust, pond-mud, liquid manures, and of several of their varieties.

There is evidence in every portion of Evelyn's works of the warm patriotism and the benevolent feelings with which he abounded. He was deeply interested, not only for the gardener, but for the people of England. His religious feelings, too, were of the highest order, and his candour was equal to his love of truth. Many curious instances of this occur in his Diary. For instance, when visiting Lord Essex at his beautiful park of Cashiobury, he notes: "April 18. 1680.—As for my Lord, he is a sober, wise, judicious, and pondering person, not illiterate beyond the rote of most noblemen in this age;" and again, when visiting the Duke of Grafton at Euston in 1677, he says in his Diary, "They love fine things, and to live easily, pompously, and hospitably, but with so vast expense, as plunges my Lord into debt exceedingly." He describes the park of Euston as having a thousand head of deer in it, "with good covert, but the soil barren and flying sand, in which nothing will grow kindly. The tufts of fir, and much of the other wood, were planted by my direction," he adds, "some years before."

Evelyn, then, is entitled to the grateful remembrance of every one interested in the cultivation of the soil, or in his country's prosperity, for he first drew the public attention to the advantages, both to private individuals and to the state, of extensive and general plantations of timber trees. He excited and directed a good and patriotic feeling, which has since his time never entirely subsided, a spirit which actuated some of the greatest of modern planters, who have constantly referred to his Sylva, and adopted many of his suggestions. He is especially to be regarded by the northern portion of our island as one of the greatest of benefactors to the soil, and even to the climate, which extensive plantations of woods are found to so sensibly ameliorate.

Although Evelyn was born before his contemporary, the celebrated Robert Boyle, yet he survived him several years. This philosopher, "the great" Robert Boyle, the fourteenth child of the Earl of Cork, was born at Lismore in 1627. He was gifted with a genius which no unfavourable circumstances could repress. Pleasure, says his biographer, failed in alluring his mind from science as completely as poverty would have been unable to depress it. He was the only son of the family who attained to manhood without the reward of the peerage, yet by universal consent he is declared to be the greatest of his kindred. "He was a Boyle," said one of his family, "but we are mere *Pimples*." Boyle was one of the first members of the Philosophical College, which eventually ripened into the Royal Society of London, but which at that period held its meetings so quietly and retiredly, that Boyle was accustomed to call it the Invisible. While at Oxford, in 1658, with the assistance of Mr Hooke, he perfected the air-pump—a machine, the invention of which may be said to have created the science of Pneumatics. Otto Guericke was the person who first publicly suggested the idea of exhausting a vessel of air by means of a sucking pump, though Boyle assures us he had previously made similar trials. This first attempt was rude in the extreme, and the chief experiment tried by Guericke was the exhausting two hemispheres, whose edges were made accurately to correspond, and which then, from the pressure of the atmosphere, required considerable force to be separated. This, from the place of Guericke's residence, was called the Magdeburg Experiment. It was first made publicly known in 1654, and was justly considered so important a discovery, as first demonstrating the pressure of the atmosphere, that it was exhibited at the Diet at Ratisbon in the presence of the Foreign Ministers and the Deputies of the Empire. Boyle's first literary efforts were in the cause of religion; and so highly was he esteemed for them, that Lord Clarendon urged him to enter into orders; but this from conscientious motives he declined, at the same time declaring, that, as a layman, he thought his exertions in favour of religion would be more influential. It was well observed of Boyle, that, being born the same year that Bacon died, he seemed by nature to have been designed for his successor; and it is certain that he was as zealous and strenuous an opponent of the Aristotelian and Cartesian philosophy, as he was the advocate of the philosophy of experiment. Public honours appear to have had a much inferior value in his estimation, than leisure for study and the acquirement of knowledge. Dignities in the Church, the Provostship of Eton, and even the Presidency of the Royal Society, were offered to him in vain. He settled finally in London in 1669, where he died December 31, 1691—lamented alike by the man of science, the patriot, and the Christian. This great philosopher must be regarded by the cultivator in a different point of view from Evelyn ;—Boyle did not cultivate the earth, but he took another important road to assist others in scientifically doing so ; he not only searched into the food of plants, examined the earths on which they grew and which they imbibed, as well as the gases which they inhaled ; but he cleared the way for and which lightened the labours of other philosophers—thus, if he did not discover, he certainly very materially improved the air-pump. He was unquestionably, as Davy well remarked, one of the most active experimenters, and certainly the greatest chemist of his age. He introduced the use of tests or reagents, active substances for detecting the presence of other bodies, and he overturned the ideas which at that time were prevalent, that the results of operations by fire, were the real elements of things. It is highly curious and interesting to mark in his writings the very dawn of our knowledge with regard to vegetable chemistry, and to note how hard this great mind was labouring towards the attainment of truth, unaided and unassisted as it was by the modern discoveries of chemistry. Let us take, for instance, his observations (v. iii. p. 69 of his works by Dr Birch) on the uses of water to vegetation. He remarks—" Water being generally esteemed an elementary body (this was one of the errors of his age), and being at least far more homogeneous than bodies here below are wont to be, it may make very much for our present purpose to shew that water itself, that is, fluid, tasteless, inodorous, colourless, volatile, &c., may, by a different texture of its parts, be brought to constitute bodies of attributes very distant from these. This I thought might be done by nourishing vegetables with simple water. For in case I could do so, all or the greatest part of that which would accrue to the vegetable thus nourished, would appear to have been materially but water, with what exotic quality soever it may afterwards, when transmuted, be endowed. The ingenious Helmont indeed mentions an experiment somewhat of this nature, though not to the same purpose, which he made by planting a branch of a willow into a pot full of earth, and observing the increase of weight he obtained after divers years, though he fed the plant but with rain water. And some learned naturalists have conjectured at the easy transmutableness of water, by what happens in gardens and orchards, where the same shower of rain, after a long drought, makes a great number of differing plants to flourish. But though these things be worthy of their authors, yet I thought they would not be fit for my purpose, because it may be speciously enough objected that the rain water does not make these plants thrive and flourish, by immediately affording the aliments they assimilate into their own substance, but by proving a vehicle that dissolves the saline and other alimentary substances of the earth, and dilates both them and the nutritive juice, which in a part of the plant itself it may find too much thickened, by the drought or heat of the ambient air, and by this means it contributes to the nourishment of the plant, though itself afterwards exhaled into vapours. And indeed experience shews us that several plants which thrive not well without rain water, are not yet nourished by it alone; since when corn in the field, and fruit trees in orchards, have consumed the saline and sulphurous pieces of the earth, they will not prosper there, how much rain soever falls upon the land, till the ground, by dung or otherwise, be supplied again with such assimilable juices. Wherefore I rather chose to attempt the making of plants grow in phials filled with water, not only to prevent the fore-mentioned objection, and also to make the experiment less tedious; but that I might have the pleasure of seeing the progress of nature in the transmutation of water. Of my observations about things of this kind, I can at present find but few amongst my adversaria, but in them I find enough for my present turn; for they and my memory inform me that Vinca pervinca, Raphanus aquaticus, Spearmint, and even Ranunculus itself, did grow and prosper very well in phials filled with fair water, by whose necks the leaves were supported, and the plant kept from sinking. Some of these were only cuttings without roots, divers of them were left in the water all the autumn and great part of the winter, and at the end of January were taken out verdant, and with fair roots, which they had shot in the water. And besides, I find that particularly a branch or sprig of Raphanus aquaticus was kept full nine months, and during that time withered not the whole winter, and was taken out of the water with many fibrous roots and some green buds, and an increase of weight; and that a stump of Ranunculus did so prosper in the water, that in a month's time it had attained to a pretty deal more than double the weight when put in. And the next note which I find concerning these plants, informs me that the above-mentioned crow's-foot, being taken out again at six months after it was put in, weighed a drachm and a half, wanting a grain and a half—that is, somewhat above thrice as much as it did at first. This last circumstance (of the increase of weight) I therefore thought fit particularly to make trial of, and set down upon this account amongst others, that having doubted the roots and leaves that seemed produced out of water might really be so by an oblongation and an expansion of the plants (as I have purposely tried, that an onion weighed and laid up in the spring, though after some weeks keeping in the air it shot blades, whereof one was five inches long, instead of incorporating the air or terrestrial effluviums with itself, and consequently thereby growing heavier, had lost nine grains of its former weight), it might by this circumstance appear that there may be a real assimilation and transmutation of water into the substance of the vegetable, as I elsewhere also shew by other proofs. For this being made out, from thence I infer that the same corpuscles which, convening together after one matter, compose that fluid, inodorous, colourless, and insipid body of water, being contexted after other manner, may constitute differing concretes which may have firmness, opacity, odours, smells, tastes, colours, and several other manifest qualities, and that too very different from one another. And besides all this, these distinct portions of transmuted water may have many other qualities without excepting those that are wont to be called specific or occult, witness the several medicinal virtues attributed by authors to spearmint, and to periwinkle, to marforom, and to Raphanus aquaticus. And as for Ranunculus, that plant being reckoned amongst poisonous ones, and amongst those that raise blisters, it will be easily granted that it hath as other poisons, an occult deleterial faculty; and indeed it somewhat deserves our wonder that so insipid and innocent a thing as fair water, should be capable of being turned into a substance of such a piercing and caustic nature, as by contact to raise blisters on a human body. And yet perhaps that is no less strange which we elsewhere relate, that a plant consisting chiefly of transmuted water, did by distillation afford us a true oil, that would not mingle with water, and consequently was easily convertible into fire. But whether or no this experiment, or any such like, prove that almost all things may be made of all things, not immediately, but by intervention of successive changes and dispositions, is a question to which we elsewhere say something, but are not willing in this place to say anything. And if it be here objected that the solid substance that accrues to a plant rooted in water, proceeds not at all from the water itself, but from the nitrous fat and earthy substances that may be presumed to abound even in common water, I shall at present reply, that though as to divers plants that flourish after rain, I am apt to think that they may in part be nourished as well by the saline and earthy substances to which the rain usually proves a vehicle, as by the rain itself; yet, as to what the objection holds forth about the plants that grow not in the ground, but in glasses filled with water, it should not be barely said but proved, which he will not perhaps think easy to be done, that considers how vast a quantity of fair water is requisite to be exhaled away to obtain as much as one ounce of dry residence, whether saline or earthy."

Such were the curious sagacious reasonings of the illustrious Boyle; he was ever on the watch for the discovery of truth, always ready to promote its acquisition. In the *Phil. Trans.* No. xxiii. p. 524, is a series of suggestions by him to try the effects of the exhausted receiver of the air-pump on plants, seeds, eggs of silk-worms. It will be seen by some of his observations which I have given above, that he was by no means an inattentive observer of the magic powers of transmutation possessed by plants. These accorded very clearly with other notions of Boyle's, for this great philosopher was perhaps the last believer in the power of transmuting other metals into gold, for he tells us, with all the earnest gravity of an alchemist, that "First I must acquaint you with what was not long since related to me by Dr K., a person exceeding far both from the custom, and in this particular from the temptation, of telling untruths. He then assured me, that, lending his laboratory, in Holland, to a friend of his during his own absence, and leaving in that laboratory, amongst other things, great store of aquafortis of several compositions, which he had made to employ about his famous scarlet dye, this friend of his sent him word, a while after his departure, that, by digesting gold with an aquafortis, he had separated the tincture or yellow sulphur from it, and made it volatile (the remaining body growing white), and that with this golden tincture he had, not without gain, turned silver (as to part of it) into very perfect gold. Upon which advertisement, the Doctor, speedily returning to his laboratory, did himself, with the same aquafortis, divers times draw a volatile tincture of gold, which did turn silver into true gold, and (that I may add that upon the bye to gratify your curiosity) when I demanded whether or no the tincture was capable to transmute or graduate as much silver as equalled in weight that gold from whence the tincture was drawn, he assured me, that out of an ounce of gold he drew as much sulphur or tincture as sufficed to turn an ounce and a half of silver into that noblest metal. But our Doctor found himself much mistaken in the hopes of growing rich by this experiment, for a while after, endeavouring to make it again, his hopes were frustrated, which he ascribes to the aquafortis, and therefore has attempted the same work afresh."

Boyle could not, when pondering over the possible transmutation of gold, long divest his mind from the phenomena exhibited in the transmutations of vegetable life; he alludes, therefore, in explanation of the Doctor's failure, to the production of various varieties of roses from one plant, and then with his usual gravity, he proceeds to carefully examine what certain learned writers had delivered as truths, "That if a lixivium made of the ashes or fixed salt of a burned plant be frozen, there will appear in the ice the idea of the same plant, for we have divers times purposely made trial of this experiment without the promised success; and I remember, that in the last cold season proper for such trials, I purposely made a lixivium of fair water and salt of wormwood, and having frozen it, I could not discern in the ice anything more like wormwood than to several other plants."

The days of Evelyn and Boyle were indeed those when science began to dawn in England, when her rays first began to extend towards the improved cultivation of the soil, for previous to that period little was known of the component parts of vegetables, their food or their habits; that the atmosphere had anything to do with their support was hardly even imagined, and till the days of Von Helmont, who was born in 1588, the existence of more than one kind of air or gas was not even suspected. Von Helmont certainly mentions inflammable gas, and gas from wood, or carbonic acid gas, which plants emit when vegetating in the dark. And although this chemist, by his celebrated experiment with a willow tree, endeavoured to shew that water, and that water only, is the food of plants, and otherwise advocated very erroneous views of the phenomena of vegetation, yet still all his experiments, like those of his great contemporaries, were of inestimable benefit to mankind, as leading to new views, fresh inquiries, additional and more accurate experiments. The chemist was only then begun to mingle more practical objects with his dreams (for even Boyle, we have seen, was one of the alchemists, as Von Helmont was an astrologer); and then came our great Bacon to mainly aid and assist in the dispersion of arguments and mere verbiage, and in the arraying of experiments and facts in their place. Bacon saw all these with the eye of a philosopher; he described the alchemists, their blunders, and their discoveries very happily, when he compared them to those husbandmen who, in searching for a treasure supposed to be hidden in their land, by turning up and pulverizing the soil rendered it fertile. In searching, says Davy, for brilliant impossibilities, they sometimes discovered useful realities. When, therefore, such men as these broke through the sage dogmas of the schoolmen,—and it was once understood that there were other component parts of this globe of ours besides "fire, water, earth, and air,"—they created doubts, which soon rendered, as it were, necessary farther inquiries. Von Helmont, as we have seen, first announced that there were more than one kind of gas, and then it was found, that so far from the air we breathe being composed of only one simple gas, that it actually consists of three; that the plants inhaled only one of these, and that animals required another; to these facts were added the separation and careful examination of them all; fresh facts rapidly accumulated, and it was speedily found that the leaves of plants not only required the free access of carbonic acid gas to their leaves, but that their roots were benefited almost in a similar degree by its application. It was found, too, that these atmospheric gases had always combined with them, a varying proportion of aqueous vapour, and many other facts now began to rapidly accumulate. Dr Black demonstrated the nature of fixed air or carbonic acid gas, and that it formed, with lime, chalk.

In the list of labourers in the field of pneumatic chemistry (a branch of the science which so materially elucidates many of the cultivator's operations), no one is perhaps more worthy of our notice than Dr Priestley, the discoverer of oxygen gas, or vital air, and the originator of many curious and instructive experiments in vegetable chemistry, who had clearly shewn that a portion of the atmosphere (oxygen gas) combined with metals and other combustibles; and now discoveries of all kinds poured in. Nitrogen, the largest portion of the atmosphere, was discovered by Dr Rutherford, and chemistry was pursued with an ardour which had not yet been equalled in any period of the history of this fascinating science.

The celebrated Priestley was born in 1733, and very early began that course of experiments upon the gaseous matter evolved by plants, which led to so many discoveries and additional important labours,—experiments which justly entitle him to the grateful remembrance of the enlightened cultivators of the earth. "His characteristics," observes an excellent chemist of our age, "were ardent zeal and the most unwearied industry, he exposed all the substances he could procure to chemical agencies, and brought forward his results as they occurred without attempting logical method or scientific arrangement. He possessed in the highest degree ingenuousness and the love of truth; his manipulations, though never very refined, were always simple, and often ingenious: chemistry owes to him some of her most important instruments of research, and many of her most useful combinations, and no single person ever discovered so many new and curious substances." To Priestley belongs discovery of the oxygen gas or vital air emitted by all plants vegetating in the light. This Priestley called dephlogisticated gas, for he flourished in the days of the unknown imaginary substance called by the chemists of his day Phlogiston. He was aware of several facts in vegetable chemistry which have since his day been announced as new discoveries; for instance, he found that although plants growing in the dark lose their green colour, yet that, when a portion of carburetted hydrogen is present in the atmosphere, as with plants growing in coal mines, then their green colour is preserved. For his discoveries in vegetable chemistry he received from the Royal Society the Copley medal, and would have been a much more useful and more popular friend to the cultivators of his country, had he not unfortunately interested himself with several political and other themes in which his success by no means equalled that which he met with in his chemical philosophy. He collected the results of his experiments in Natural Philosophy into six separate volumes, which he republished in 1790 in three volumes, with a long rambling preface of 44 pages, in which he mixed up his chemistry, divinity, natural theology, and political opinions with the zeal of a martyr, and all the simplicity of a child. He was ever anxious, in all his researches, for the advancement of truth, and told his readers, p. 16, that, "For the sake of conciseness, I have not indeed troubled the reader with every conjecture and hypothesis which I formerly adopted, but I have not failed to mention the most considerable of them, not being ashamed of the mistakes I have made, and being willing to encourage young adventurers by shewing them that, notwithstanding the many errors to which even the most sagacious and the most cautious are incident, their labours may be crowned with considerable success."

He spoke, too, with all the modesty of a man of real science, of his own important discoveries, when he said,—"As to myself, I find it utterly impossible to produce a work on this subject that shall be anything like *complete*. Every publication I have frankly acknowledged to be very imperfect, and the present I am as ready to acknowledge is so. But paradoxical as it may seem, this will ever be the case in the progress of natural science, so long as the works of God are like himself, infinite and inexhaustible. In completing one discovery, we never fail to get an imperfect knowledge of others, of which we could have had no idea before, so that we cannot solve one doubt without creating several new ones. The greater the circle of light, the greater is the darkness by which it is confined; but notwithstanding this, the more light we get, the more thoughtful we ought to be." He quotes a saying of Father Beccaria, the philosopher of Turin, with regard to the great Franklin, which in a great measure is well applied to Priestley,—"I am sorry that the *political world*, which is so very transitory, should take the great Franklin from the world of nature, which can never change or fail." "Could I imagine," he adds in another place, "that the knowledge of nature could ever be exhausted, and that we were approaching to a termination of our inquiries, I could more contentedly shut my eyes on a scene in which nothing more was to be seen or done. But to quit the stage at present (and I believe the aspect of things will be exactly similar in any future period of our existence) without the hope of revisiting it would fill me with the deepest regret. Thus I feel on the idea of ceasing to breathe, when I have just begun to know what it is that I do breathe."

When Priestley describes his experiments and his modes of operation, there is nothing of the incomprehensible recipes of the alchemists about the detail. All seems so attractively simple that a child might repeat them. Take, for instance, his account of the way he operated in experimenting upon the breathing of animals. "If I want to try whether an animal will live in any kind of air, I first put the air into a small vessel (inverted over water), just large enough to give it room to stretch itself, and as I generally make use of mice for this purpose, I have found it very convenient to use the hollow part of a tall beer glass, which contains between two and three ounce measures of air. In this vessel a mouse will live twenty minutes, or half an hour. For the purpose of these experiments, it is most convenient to catch the mice in small wire traps, out of which it is easy to take them, and holding them by the back of the neck, to pass them through the water into the vessel which contains the air. If I expect that the mouse will live a considerable time, I take care to put into the vessel something on which it may conveniently sit, out of the reach of the water. If the air be good, the mouse will be perfectly at its ease, having suffered nothing by its passing through the water. If the air be supposed to be noxious, it will be proper (if the operator be desirous of preserving the mice for farther use) to keep hold of their tails, that they may be withdrawn as soon as they begin to show signs of uneasiness, but if the air be thoroughly noxious, and the mouse happens to get a full inspiration, it will be impossible to do this before it be absolutely irrecoverable. Mice must be kept in a pretty exact temperature, for either much heat or much cold kills them presently. The place in which I generally kept them was a shelf over the kitchen fireplace, where, as it is usual in Yorkshire, the fire never goes out, so that the heat varies very little, and I find it to be, at a medium, about 70 degrees. When they had been made to pass through the water, as they necessarily must be in order to a change of air, they require and will bear a very considerable degree of heat to warm and dry them."

He ascertained, as I have before remarked, many curious facts, which have, since his time, more than once been announced as new discoveries; he found (vol. i. p. 224) that plants would grow for several months in hydrogen gas, and that the gas became in consequence somewhat less inflammable, but they speedily perished when placed in nitrous acid gas; and he found, too, that a confined portion of air, deprived of its oxygen by a lighted candle, had its oxygen restored by a sprig of mint being confined in it, and that so completely, that a mouse placed in it suffered no inconvenience, and a candle again burnt in it as well as the first. "I generally," he says, "found that five or six days were sufficient to restore this air when the plant was in its vigour; whereas I have kept the same kind of air in glass vessels, immersed in water many months, without being able to perceive that the least alteration had been made in it." How near he was to the discovery that it is oxygen gas which is always emitted by growing plants, will be perceived by his remark: "This restoration of air I found depended upon the *vegetating state* of the plant, for, though I kept a great number of the fresh leaves of mint in a small quantity of air, in which candles had burnt out, and changed them frequently for a long space of time, I could perceive no melioration in the state of the air."

At page 255 of vol. iii. he has a section upon "the restoration of air, infected with animal respiration, or putrefaction by vegetation." In this he details a mass of laborious experiments, upon which succeeding chemists refined, and of which the scientific cultivator often unknowingly avails himself—principles which Priestley's experiments thus, for the first time, demonstrated. Dr Franklin, to whom Priestley communicated these curious and instructive experiments, wrote to him immediately, observing very justly, "That the vegetable creation should restore the air, which is spoiled by the animal part of it, looks like a rational system, and seems to be of a piece with the rest—thus, fire purifies water all the world over. It purifies it by distillation when it raises it in vapours and lets it fall in rain, and farther still by filtration, when keeping it fluid it suffers that rain to percolate the earth. We knew before that putrid animal substances were converted into sweet vegetables when mixed with the earth and applied as manure; and now, it seems, that the same putrid substances mixed with the air have a similar effect. The strong thriving state of your mint in putrid air, seems to shew that the air is mended by taking something from it, and not by adding to it (the plant does both, it emits oxygen gas, and absorbs the carbonic acid gas, &c., produced by combustion and putrefaction). I hope," he adds, "this will give some check to the rage of destroying trees that grow near houses, which has accompanied our late improvements in gardening, from an opinion of their being unwholesome." At page 293 he has a chapter on "the purification of air by plants, and the influence of light on that process." The very title betrays the knowledge to which he had attained, for it is well known now, that it is only plants growing in the light that purify air.

Priestley tried the effect of various solutions upon vegetation in a great variety of ways; he saw the importance of the research in its true light, and he commenced with an ardour that few difficulties were likely to surmount. He thought, for instance, that plants were endued with sensation, and that like animals they were effected by various stimulants. "To try, he says, the effects of different stimuli on the roots of plants, I put into phials, containing an ounce measure and a half of common water, small quantities of common salt, from one grain to twelve, and more. In all those which contained more than twelve the plants died immediately, but in that phial the plant lived a few days, and the rest died in their order to that which contained three grains of salt, which seemed to grow as well as the plant in simple water. And it was remarkable that not only the plant, but also those which had died, seemed to flourish more *at the first*, than those which grew in simple water; and that which had three grains of salt, and also that which had one grain, *continued to live* after the plant in simple water was dead."*

Almost every page of Priestley's works, in fact, betrays the indefatigable ardour with which he enquired into the food and habits of plants; and, although mixed up with many rude experiments and false conclusions, yet, after making all these deductions, a rich mass of valuable matter still remains to reward the reader for the trouble of travelling through the six volumes of his works on Natural Philosophy.

Such, then, was the progress made in vegetable chemistry—such the noble services rendered to agriculture, by one or two only of the great chemical philosophers who adorned the middle and latter portions of the eighteenth century—labours of which modern agriculturists are in every direction reaping the advantage. Thus Priestley's discoveries, with regard to the effects of air on plants, elucidated at once the great truths for which Jethro Tull had so long and so ardently contended, that the leaves and the roots of plants could not be too copiously supplied with atmospheric air. These every farmer feels are now well demonstrated by the success which attends his wide drilled rows of corn—the horse-hoe husbandry, the ridge system of drilling turnips, and many other phenomena of vegetation, of which I need not now remind him. To such men as these the scientific cultivator well knows that organic chemistry is indeed deeply indebted. And even the most thoughtless farmer cannot but derive advantage from the study of the works of men like them, for even he must admire their indefatigable search after truth ; and when he sees how difficult it was for them to make such valuable advances in knowledge, as they did so steadily and so patiently, he will perhaps be inclined to believe that as they, by steady perseverance and laborious experiments of sometimes the most unpromising kind, succeeded in reaping at last an abundant harvest, so it is more than probable that, by the cultivation of a similar spirit of rational, cautious, enquiry, fresh and valuable discoveries of new plants, yet unsuspected properties in these at present produced, and new and more profitable modes of tillage, will yet arise to reward, to elevate, and to honour, many future generations of scientific and prosperous farmers.

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* Natural Philosophy, vol. i. p. 106.

ON TRIGONOMETRICAL SURVEYING AND LEVELLING.

By W. Galbraith, A.M., Edinburgh.

In a previous number of this Journal for March 1840, I gave a short sketch of the history of the various proposed surveys of Scotland, and of the methods that ought to be pursued to ensure the necessary accuracy. I also applied these methods partially to some small surveys, and to the astronomical determination of the position of a few points, which alone could be accomplished by a single individual from his own labour, and at his own expense. By these I shewed that the maps and marine charts now in the hands of the public, were very erroneous, and the absolute necessity there was for new surveys, especially by a government which had postponed those of Scotland repeatedly, under the plea of surveying other more important or more necessary parts of the empire, or of its dependencies. Without impugning the impartiality of these views, we may be allowed to urge the claims of the people of Scotland to a share of the attention of government, for their peaceable, orderly, and industrious habits. From this consideration it would appear, that had a small part of the expenses, saved on the very moderate military force necessary here, in comparison with that elsewhere, been so employed, Scotland might have been accurately and minutely surveyed many years ago. But while justice to other parts of the United Kingdom is constantly ringing in our ears, justice to Scotland is seldom heard, and consequently her interests have been frequently sacrificed to other parts of the empire, whose inhabitants are more clamorous, though, in our humble opinion, the most worthy ought always to be the most highly favoured. Without wishing, by these remarks, to give offence in any quarter, we certainly do think that the claims of Scotland ought to have been attended to many years ago, because it will presently be shewn that the maps of the country in those localities which I have lately had an opportunity of examining, ought more properly to be designated *caricatures* than *accurate maps*.

Now, however, there is every reason to believe that the survey will be vigorously prosecuted, since, if we are rightly informed, an Act of Parliament has lately been passed, granting to the northern counties of England, and to the whole of Scotland, with the adjacent isles, a regular survey on a scale of six inches to a mile, in which it will be possible to insert every object of importance, and to determine accurately the area of the whole country, as well as that of the minor subdivisions. Parties of the sappers and miners have been, and now are, busily engaged in erecting the necessary piles on conspicuous heights, in various parts of the country, to be observed by the surveying engineers, forming a kind of network of triangles, covering the whole country, constituting what is technically called the *primary* triangulation, whose sides extend to thirty, forty, fifty, and in some rare cases, to *one hundred miles*. These are then subdivided into others, whose sides extend to ten or fifteen miles, called the *secondary* triangulation, which are again broken down into others still smaller, having sides of four or five miles, called the *tertiary* triangulation. The *old* three feet great theodolite, and the *new* two feet circle, by Troughton and Simms, are employed on the primary triangulation, the twelve inch circles generally on the secondary ; and, finally, the seven and five inch theodolites on the tertiary, whose subdivisions are filled in and completed by the chain. In the primary triangulation especially, it is to be hoped, according to the plan generally followed on the Continent, that all the three angles in each triangle, will, if possible, be *always* observed. In my opinion, a cylindrical pole should be inserted in the centre of the piles, as the axis of the signal to be intersected at distant points, since, without these, it appears to me, that a very accurate bisection can hardly be effected. I had some experience of this last autumn, during my observations on Goatfell, in the island of Arran, which will be detailed in a subsequent part of this paper, and was even obstructed, and had my observations rendered somewhat discordant, by the unintentional thoughtlessness of some of our tourists who got upon the top of the pile, and partially injured it during my operations, so as to render the bisection of the same point hardly possible. It is, therefore, the duty of all sheriffs, justices of the peace, magistrates of burghs, and country gentlemen, to endeavour to protect these piles, and, if possible, to punish offenders, so that the engineers may be enabled to pursue their operations as rapidly and successfully as the nature of the service will permit. In the *Nouvelle Description Geometrique de la France* (an operation similar to our Trigonometrical Survey,) *Premiere Partie*, page 156, by M. Puissant, it is said, that in the triangulation of Italy, by MM. Plana and Carlini, embracing a chain of sixteen triangles, extending from Superga, near Turin, to Mont Colombier, in Savoy, the angles of every triangle have been all measured with so much precision, that the greatest error of the sum of the three angles of one of these triangles did not exceed 1¼ seconds. Without an accurate and well-defined system of signals, such a degree of precision is unattainable, even in the fine climate of Italy, and still more so in the very inferior and unsteady weather in Scotland, especially in the moist atmosphere among the Hebrides. Notwithstanding the apparently formidable difficulties attending our survey from these causes, still, however, every exertion should be made to equal them in accuracy, or even to surpass them, if possible. This can only be done by repeating the observations of all the three angles of every triangle, a considerable number of times, the signals marking the triangles of the first order, having a height of about $\frac{1}{10000}$ of the length of the sides, and the diameter of the base one-third of the height. Their local position should be so chosen, as to be seen against the sky, or the sum of the two zenith distances of the summits of any two piles, should, at the intermediate one, exceed 180°. If this cannot be done, then the signals are projected on the soil, and they should be painted *white*, if on a *black ground;* but black, if on a white or light one. In general, reflecting heliostats, of a simple construction, such as those employed on the Trigonometrical Survey, will be found very useful; but there should be some definite mode of placing them in the axis of the pile, by means of a central wooden pole. Signals for the triangulation of the second order, should have about the same proportion to the sides of their triangles, and for those of the third, simple poles will be sufficient. The horizontal and vertical angles of triangles of the first order, should be repeated about *six* times, those of the second order *four* times, and those of the third, *three* times, at least, which in favourable cases may be increased, but in no case diminished. That the state of the atmosphere may be as favourable as possible, the observations, especially for levelling, should be made towards mid-day. In all cases accurate plans of the signals should be made, and marks formed of as large stones as possible, by means of a hole, cut, or *jumped*, as it is technically called, in them, with the usual Government mark, the arrow, cut upon them, so that they may be readily discovered at any future period, if required; as doubtless, for many private connected surveys they continually will be. In fact, the different points fixed in the course of the survey ought to be so accurate, as to serve for standard points in geographical position, as well as those from which levels may be taken for railways, canals, water-courses, land-draining, and various other purposes.

Great care should be taken to avoid confounding hills near each other, which have analogous names. For instance, in the island of Arran, two heights on the ridge between Broddick and Lamlash, have been confounded, and the name of the one transferred to the other, in no less than three different maps of the island, namely, that in Thomson's large County Atlas of Scotland, in Mr John Patterson's Prize Essay, published among the Highland Society's Papers, and Mr Andrew Crombie Ramsay's "Geology of the Island of Arran, from *Original Survey*." Other instances of similar blunders might be produced. The two hills to which allusion has just been made, are Dunfion and Dundubh. The former should be placed close at the sea-shore, near Corrygills, which is its real position, and the latter more towards the interior of the country. In the three maps alluded to, all professing great accuracy, these two hills are reversed, each succeeding map being, I suppose, copied from its erroneous predecessor.

It would contribute greatly to our general stock of information, if a careful attention were paid to the proper names of all places of interest throughout the kingdom. Almost all the names of the more ancient places, towns, castles, &c. are radically Celtic, and it would be advantageous to those taking an interest in such matters, if their proper orthography were strictly adhered to, with their interpretation accompanying them. The former and present Statistical Account of Scotland, now publishing, have done much in this department to satisfy the geographer and geologist; and it would be desirable to embody in the new maps, about to be constructed from the Ordnance Survey, on so magnificent a scale, the name of every place, accurate in its orthography, with a proper account of its peculiarities, in a general accompanying memoir, historical, topographical, and geographical. There are doubtless several gentlemen in the country well acquainted with the ancient British and Celtic dialects, whose aid in such a cause would be highly acceptable. The services of such men as Dr Macleod of Glasgow, and many others, who are intimately and critically conversant with Gaelic literature, and Celtic history, would be invaluable in such a work. In this memoir, care should be taken not to enter into the regions of fable, or to indulge in far-fetched analogies, in tracing the etymology of the names of places. Take, for example, *Dunoon*·

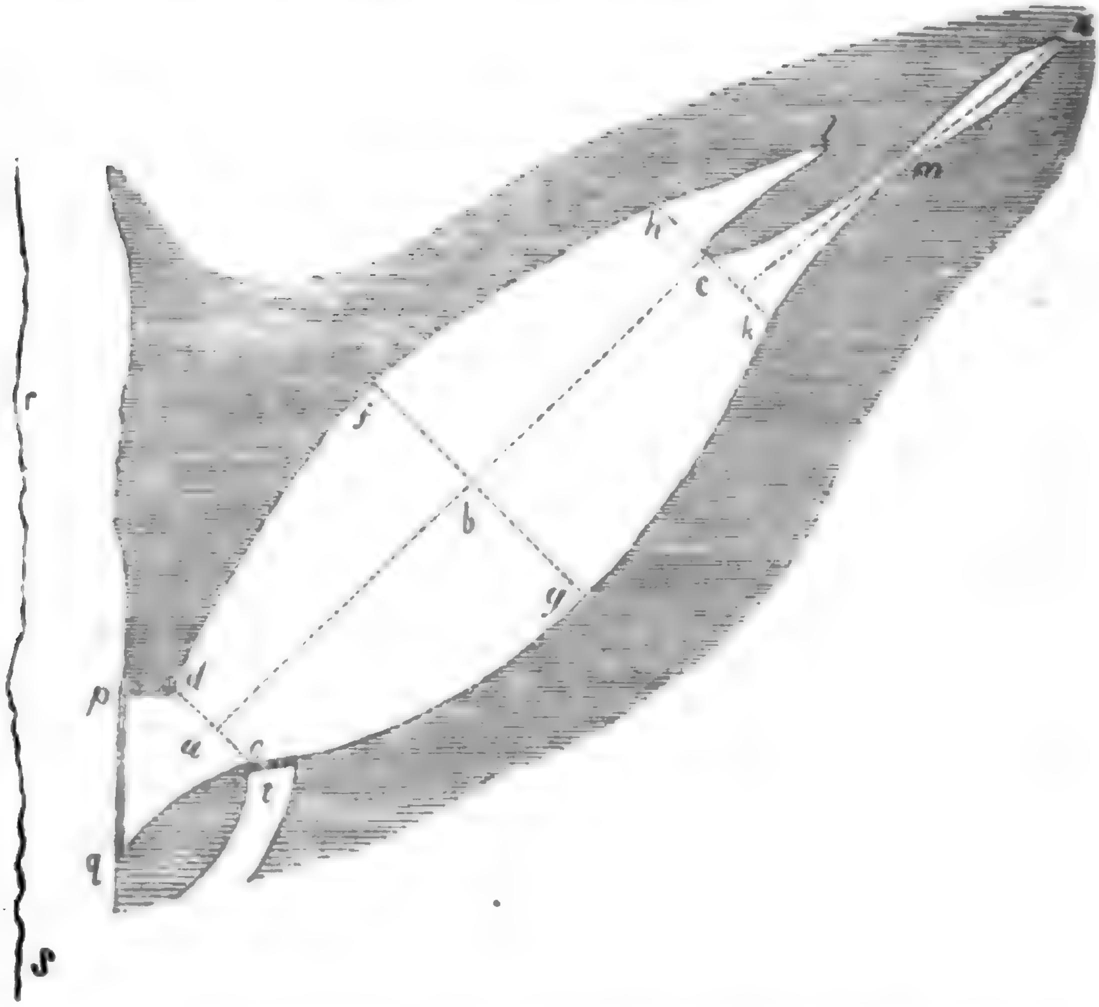
It is supposed by some to be derived from the Gaelic word *Dun*, a castle, and *Nuadh*, new; and hence Buchanan, in his Latin History of Scotland, writes it *Noviodunum*, Newcastle. By others, it is derived from *Dun-oighean*, the castle of virgins; by others, *Dun-Owen*, Owen's Castle, &c. All these seem to me to be caused by needlessly wandering from the point, straining to seek some important derivation, when none, in my opinion, is necessary. To one like me, not very much initiated in *Celtic lore*, it appears to be derived simply from *Dun-Uaine* in Gaelic, signifying, in plain English, *Greenhill*, exactly descriptive of the little green hill on which the castle formerly stood. The same or similar observations may be made on many learned disquisitions on Highland etymology. But though, in some instances, these designations may be carried to an unwarrantable extent, yet it must be admitted that a judicious interpretation of Celtic names, by a competent scholar, would be a highly important addition to any memoir accompanying the Ordnance maps, or to a geological survey it would prove highly interesting and instructive. In most of our maps of the Hebrides, there are certain rocks on which Mr Stevenson is now erecting a lighthouse, designated *Skerryvore*. This orthography is refined upon in the map of the Hebrides, published by the Society for the Diffusion of Useful Knowledge, and is engraved *Skerry-more*. The truth is, the real Celtic orthography is, or ought to be, *Sgeir-mhor*, pronounced Skaervore, since there is no v in the Gaelic alphabet, but, as in this instance, has its place supplied by mh, whose sound is v. Sgeir-mhor means, in English, the great rock, and is pronounced by most people nearly in accordance with the Gaelic, Skerryvore. This change, therefore, is not an improvement. Again, we have the Duheertach rocks, that is, in Gaelic, *Dubh Iar Tadh*, in English, the black western ledge. In like manner, there is Dusker, that is, *Dubh Sgeir*, the black rock; *Hysker*, that is, *Ii Sgeir*, the islet rock, &c. All these are so disfigured by the ignorance of surveyors, that, in a few years, their real meaning will probably be lost if some means are not taken in the survey about to be commenced to rectify these mistakes. A ludicrous instance of the same kind is committed by Messrs Sedgwick and Murchison, in their geological survey of Arran. They describe a rock which they write *Craig-a-cajou*, and translate *a mountain of cheese*, whereas the true orthography is Creag-a-caise, *the very steep rock*. Even an investigation of this kind in England would be interesting to philologists and antiquarians. For example, *Dover*, in Kent, is compounded of two words radically Celtic, namely, *Dha*, two, and *Barr*, a height; hence a Celt would infer that there are two heights or *cliffs* at Dover. In fact, this appears to have been the British pronunciation nearly, in the time of the Romans, who wrote it *Dubræ*, *Dubris*, &c. In like manner, *Calais*, in French, is synonymous with *Caolas* in Gaelic, signifying a *strait* or *ferry*. Hence Calais is the town on the ferry between France and England. From this word, also, we have the *Kyles*, of Bute; *Ballychaolas*, corrupted into Ballyhulish, Ballyhelish, &c. Many other instances of this kind might be produced, where a memoir on the Gaelic or Celtic names of places in Britain would be highly valued by the antiquarian and philologist; and it is here attempted, accordingly, to call to it the attention of those who may have any influence in recommending a memoir philological, geological, and topographical, to accompany the Ordnance Survey; because, if the present opportunity be lost, such another may never again occur.

Plans and dimensions of places celebrated in the history of the country, should likewise be accurately made. Notwithstanding the martial deeds of Bruce in rescuing his country from the grasp of England, in these days little attention has ever been paid to many of the points constituting the scenes of his noblest sacrifices, or of his bravest actions. Till within these few years the cave where he resided, on the west coast of Arran, as a fugitive, when a price was set upon his head, before the commencement of his final effort to recover the Scottish crown, which ultimately proved successful, no care was taken of, or mark of respect paid to, the place which, for a short time, lodged and protected one of the greatest princes that ever swayed the Scottish sceptre. When I resided in Arran a few weeks in August and September last, in addition to a few astronomical observations, I resolved also to make some geological and antiquarian. On visiting this cave, hallowed by every patriotic Scotsman, I was highly gratified to find that, at the joint expenses of the Marquis of Douglas and Lord Bruce, both lineally descended from this their heroic ancestor, a wall had been built to protect a place so justly venerated. This cave lies about two miles north of Blackwater Foot, and about a mile north of *Dun* Point. The latter forms a conspicuous basaltic promontory on the west coast of Arran, and is separated from the adjacent country by a considerable valley, in some parts swampy. The basaltic front next the sea is inaccessible from the steepness and height of the rocks, and, on the other side, it appears to have been inclosed by a strong dyke of large stones, now in a dilapidated state; but that, perhaps, in early times, served as a place of safety for the natives and their cattle in cases of danger.

The farm-place behind this height is called *Driom-a-dun*, that is, the back of the *dun* (*hill* or *castle*), and is frequently applied to this noted promontory, bestowing upon it the name of *Drummadoon*.

Tradition says that Bruce continued *five* days, and had *five* attendants only when he resided in this cave, previously to his going across the island to Kingscross, whence he sailed to Ayrshire, landed near Turnbury Castle, and commenced war against the English, which he carried on till the decisive battle of Bannockburn fixed the crown of Scotland permanently on his head. It is rather irregular in all its dimensions, and I therefore confined my measures to those most important, reserving a more minute survey to some future opportunity.

The adjacent figure is a horizontal section of Bruce's Cave, in which *a c*, the length bearing nearly north-east, measured 96 feet; *d e*, the mouth, 14 feet; *fg*, the greatest breadth, 42 feet; *h k*, the head, 22 feet; the branch *c l*, 23 feet; of the branch *cn*, the part *k m* is 28 feet, and, by report, *m n* is about 30 feet. The passage from *k m* to *m n*, at the point *m*, is so narrow, that I could not get through it to the interior department *m n*. The guide who assisted me in making the necessary measurements informed me that he had been in it when a boy; that formerly the passage was larger, but that it had been partially filled up; and that, by tradition, it was generally said that Bruce had it so formed, that he could retreat to it as a place of safety in time of danger. I had not a pole of sufficient length to measure the height of the highest point of the roof nearly above the point *b*, but by estimation it could not differ much from 45 feet. I found also, by direct levelling, that the height of the lowest point of the bottom of the cave at *b* was 17 feet above high-water mark towards *r s*, the shingly beach, *p q* is the new wall, and *t* another entrance closed by a gate. This height above the sea corresponds nearly with the height of the low belt of alluvial soil, which nearly surrounds the whole island, and which is generally admitted by geologists to have been the sea-beach in former ages, and that these caves have been originally formed at that period by the action of the ocean. The strata to the south of Bruce's Cave have in general a dip slightly to the *south*, at a small angle of 2° or 3°. From the cave northwards, the inclination of the strata on the shore is not very well defined. There seems to have been considerable disturbance from trap veins or dykes cutting the sandstone at right angles in directions nearly N. and S. and E. and W.



The last rock to which I had access on the Machrie shore, consisting of conglomerate, inclined at an angle of about 5° to the north, though, in general, the sandstone on both sides of the island, at this latitude, dips to the south. On the west coast, the dip to the south continues for some distance northward, but at a greater angle, or nearly 50°, near the foot of Iarsa Water.

In travelling northward, the mica slate and schist continues to dip at the same angle, slightly less or more, as carefully and repeatedly determined by the clinometer.

At Whitefareland, near the sea-shore, I took the bearing of Skipness Point, by Schmalcalder's compass, and found it to be N. 42° E., while, on turning round the sight vane, I found the bearing of the eastern shore of the Mull of Cantyre to be N. 224° E., giving a difference from the former of 182°, making these points nearly in a straight line with the station of the instrument at Whitefareland, in Arran. These observations were made with a view to test the maps of this part of the country, especially that of the Society for the Diffusion of Useful Knowledge, which some are in the habit of eulogising, both for its cheapness and accuracy. Inclination of the strata along the shore, varying from 35° to 45° southerly. A short distance along the shore, a little to the north of Altgollach Bobbin Mill, the dip increases to 70°, nearly west.

A little farther along the shore, the dip again decreases to 30°, bearing true west. Near Thundergay, close on the shore, with Schmalcalder's surveying compass I took the bearing of Skipness Point, and found it N. 44° 30′ E., and that of the eastern shore of the Mull of Cantyre bore N. 224° 30′ E., whence it is inferred that a person standing on Skipness Point will see the western shore of Arran, and the eastern shore of the Mull of Cantyre, *in a straight line.* Let any one compare our best maps and charts with this test, and he will be certainly surprised at the grossly erroneous relative positions of these points in these *caricature prints.* The dip here is about 60° bearing W.N.W. A little farther on towards Catacol Bay, the dip is from 45° to 50° N.W. From this point if the same law of change of the direction of dip had continued, it would have approached the north. Thus directly in a gradual manner along the shore, the dip changed from south to north on the west coast of Arran. But, at Loch Ransa, it again dips to the south at an angle of 35°. Something similar takes place on the east shore, where those rocks on the *south* of the *anticlinal axis*, near North Sannox, dip to the *south*, and those on the north of it dip north; but the change in the one case is abrupt, while, in the other, it appears to turn about gradually. Though I examined the shore from Catacol Bay to Loch Ransa with some care, I could not discover any change decidedly *abrupt* in the inclination of the strata, so as to give a direct name to it, such as *a sub-contrary section*. Can all these extraordinary contortions be attributed to the upheaving of the great central mass of the Goatfell range? This is a point certainly worthy of the serious attention of the geologist, for I am fully persuaded that the geology of this surprising island is yet far from complete. My time was so much occupied with other pursuits that I could not pursue these interesting researches farther, and the observations in 1836 and this year 1841 were too isolated and unconnected to be regularly detailed and laid before the public. They may, however, when more complete, form the subject of a paper at some future period. I shall now proceed to detail the results of a few astronomical observations made at Ayr and Arran. From some previous observations I had discovered that the maps and charts of the Frith of Clyde were exceedingly erroneous, and that it was the duty of government to cause an accurate survey to be immediately completed for both the benefit of agriculture and commerce.

This circumstance induced me to observe with my altitude and azimuth circle, carefully the latitude of a convenient station near some well-known and important point, so that, by a simple trigonometrical operation, I might obtain from the latitude of my station that of the adjacent point with equal precision. For this purpose I made, in the month of August last, *ten* series of observations on the polar star, to the *north* of the zenith, and eight to the south, namely, six series on the sun and two on α Aquilæ. The mean of these gave, for the latitude of my station, 55° 27′ 56″.74 N., the difference of latitude between this station and Ayr high spire, is 1″.16

south. Deducting this, the final latitude of Ayr high spire is 55° 27′ 55″.58 N. In a late survey, by Captain A. Henderson, R.E., trigonometrically it was 55° 27′ 53″.8 N. less than the preceding by 1″.78 only. There was indeed a slight oversight in the latter, as I had previously suspected, but on communicating my suspicions to the Ordnance Map Office, this was speedily rectified; and of this I gave a notification to the marine surveyor, now engaged in the Frith of Clyde, that the accuracy of his chart might not be in any way affected by it. By a mean of twenty series of observations made in 1836 and 1841, and deducing that of Goatsfell from the observed latitude of my station, it turned out to be 55° 37′ 36″.27 N.; while Captain Henderson's trigonometrical operations about 1837, gave 55° 37′ 36″.0 N., agreeing within a quarter of a second, which is no doubt owing to accident, as, from the instruments employed, neither of us could, in every case, warrant such an agreement. It is clear, however, from these results, that the positions of these standard points in the survey have been determined with sufficient precision. In these operations I have merely stated the results, but the methods of operation are given in considerable detail in my treatise on Surveying and Levelling, just published by Messrs William Blackwood & Sons, Edinburgh.

In 1836, by observations taken near Broddick, I found the height of Goatfell, above the mean level of the sea, to

be, ...	2862.7 feet.
By those in 1841, . . .	2860.3 ,,
The mean of both, .	2861.5 ,,

The height of the base was determined by direct levelling; and, consequently, I believe I may with confidence state, that the preceding mean is the true height. I am therefore obliged to affirm, that the height determined barometrically by M. Necker in 1839, and published in the Transactions of the Royal Society of Edinburgh, is too great by ninety-eight feet, or about one-thirtieth part of the whole height.

FURTHER HINTS FOR THE IMPROVEMENT OF AGRICULTURE.—ON LEASES,

By Mr JOHN HANNAM, North Deighton, Wetherby, Yorkshire, Honorary and Corresponding Member of the New York State Agricultural Society.

Having in a former paper* discussed the importance of Agriculture, and the consequent necessity of lending our utmost efforts to foster its improvement, and having at the same time shewn such means as were, in my opinion, calculated to promote that improvement, in making any further suggestions on the same subject, it will not be necessary to shew cause *why* we should endeavour to carry out all hints that will give an impetus to the progress of agricultural knowledge, but merely to shew that *these* will tend to that end.

Before proceeding, however, to offer any suggestion, or to shew its operation, let me guard against misconception; let it not be supposed that I undervalue any of those means for the promotion of British husbandry which I have at a former period urged the adoption of,—urged, too, as the "best,"—because at this particular period they are the preliminary steps to other and more intricate paths, which can never be entered upon until the gateway is free from obstructions; for it cannot be hoped that other means, which involve a sacrifice of self-interest or of personal prejudices, can be extensively employed until agriculture begins to assume its proper position as a science, and as a national interest. When, indeed, by the means which we have before discussed, we see it regarded as that stay to the good ship which enables her to ride in the harbour in safety, while others are tossed upon the treacherous waters; when, by the united effort and individual exertion which those means develope, we see the triumphs of agriculture alike clearly written on the face of the soil and the forehead of the cultivator; when, in fact, what has been done teaches the public to *think* what will next be done; when the public mind begins to *feel* the impulse which, I am proud to say, through such means, it has received, then will the veriest sluggard find it his interest to move on with the crowd. As he runs, too, he will read a lesson of instruction in every field. When this is the case (and it will be so, and that shortly, I am sanguine enough to believe), it will only be necessary to hint in order that a means of improvement will be adopted, and then we may hope to see private prejudice and individual conceit give way to any and every instrument that will aid in the discovery of those treasures which are yet buried in the earth. Under present circumstances, however, if we would see a flourishing harvest of improvement, it is as necessary to prepare the soil as to sow the seed.

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* *Vide* Quarterly Journal of Agriculture, vol. xi., p. 456, in an essay on "The Importance of Agriculture, and the best means of promoting its Improvement."

From this, then, it will be evident, that, though I have already urged the adoption of certain suggestions as the *best* means of promoting the improvement of agriculture, because they *were the best preparatives for every other*, and because they did not press upon any particular class, but were such as every one, however high or however low, could encourage or promote in some degree, I do not consider them as the *only* essentials to improvement, but merely as agents which are preparing the public mind for the adoption of *all means* which tend to that end. Nor, in offering any other hint towards attaining that end, do I at all undervalue or depreciate what I have urged before. At that time (p. 460, vol. xi. of this Journal) I did not forget to intimate that, after we had done all that then seemed good, much still would be required of us. "Excellent," I observed, "as are the means which have been proposed, and which we have discussed in the preceding pages, when the friend of agriculture has supported these, as it is absolutely incumbent upon him to do, he has not done all. Many means of benefiting the cause may be suggested, or may accidentally offer themselves, which I am far from inferring should be neglected, because they are not mentioned here; on the contrary, I would remind him that it will be his duty, as a good and faithful servant, to turn them to the very best account."

And it is this impression, strengthened by the foregoing reasons, and by the conviction that the *first fruits* of even a partial adoption of those preparatory means, of which we have spoken, have *begun to develop* themselves, and that there is, at the present moment, a large portion of the agriculturists of Great Britain ready to take at the tide *every* or *any* means that will promote the cause in which they are embarked, that impels me to offer any further suggestions to their notice. With these considerations in view, I feel that though I may not be able to urge the adoption of what I propose as *absolutely* necessary, if I can shew that it will do anything in furtherance of agricultural skill, my labour will not be in vain. This, then, be my task,—a task the more grateful when I reflect that there are no preliminary or practical difficulties to oppose the execution of what I would suggest; for if those to whom I appeal have the will, they have always the power to carry it out into practice.

This will require no further illustration, when I state that my object is to suggest to the landowners of the United Kingdom the propriety of *abandoning the present practice of letting their farms from year to year, and of adopting*, in lieu thereof, short leases of, say, from twelve to twenty years.

The propriety or policy of this change will be seen by a glance at the permanent evils of the one, and at the advantages of the other. The first and grand evil of the tenant-at-will system is, that it *checks the spirit of agricultural improvement.* This it does at the present time most especially. Within the last ten or a dozen years, intelligence, we know, has spread most rapidly over the country; means have been taken which have drawn out a mass of agricultural knowledge scarcely ever dreamt of in the philosophy of our former agriculturists; the united efforts of the most enlightened of their class have tended to diffuse this knowledge into places hitherto impervious to improvement; success has stimulated exertion, so that our land may be now fairly said to represent a body through which a flow of vital fluid is continually circulated, by the means of the heart, arteries, and veins. Thus information flows from society to society; theories born in the closet are tested by practice; and from club to club, from county to county, their truth is confirmed, or their errors exploded. *Truth is scarcely born before she becomes old.* In fact, not a month passes in which something is not done—in which something is not learnt or unlearnt—in the science or practice of agriculture. And we may therefore fairly presume, that there is scarcely a place in which there is not *one* man who has banished from his vocabulary the word *best*,—who "acknowledges no perfection, and knows no impossibility;" and that there are very few farmers indeed, whose ears are shut to *all* and every voice of instruction in the work of improvement. How seriously, then, must the tenant-at-will system check the progress of this improvement. When agriculture was to all appearance a *stationary* practice, this method of letting the land might have no ill effect of consequence to the prosperity of the farmer; *now*, however, that it has become a *progressive* science, how many impediments does the system oppose to its equal progress as a practice! We know that every change from evil to good, in management, involves an outlay of capital; we know, too, that in every field there is an unworked mine of agricultural wealth; but it cannot be brought to light without an expenditure of money, which, once sunk in the soil, *can only be recovered in the course of years.* Can the farmer, then, who has his farm from year to year only, with justice to himself and his family, enter freely upon this outlay? He may do something, but how much less will it be than he ought to do? But, how many are they who will do nothing in such cases, except what is compulsory? And are they blameable? I think not. Human prudence, family affections, aye, and selfish care, will oppose many and pungent obstacles to any man's investing his property in a speculation the proceeds of which he may never be permitted to reap. I am not so ungenerous as to hold up, as a bugbear, that a landlord's *tyranny* is to be feared. From that source, I believe, the farmer is pretty safe, if we may judge by many of the chief landed proprietors' examples; but still, though he may *actually* be safe, he has no *real security* that he is so; and the very idea of this is enough to alarm his worldly prudence, and to effectually put away his ideas of permanent improvement or large outlays. But were the tenant ever so confident in the good faith of his landlord, can he build upon this? His landlord is but a man; as such he *may err*, but he *must die*. The same rule applies to the tenant himself; yet, if either of these contingencies should happen to one or the other, what is the consequence? If either of the parties should err (and the tenant can no more answer for himself at all times, than he can for the owner of his farm), and necessity may tempt either to do that which is not strictly just, misconceptions may arise (and where there are factors, agents, stewards, &c. in the matter also, without imputing motives to any, we are aware these *will* arise at times), and proceedings result, the consequence of which, if it be merely a *separation of interests in the eye of the landowner, is ruin to the too confiding tenant, whose little whole* is invested in his soil. Again, if either landlord or tenant should die, where is the tenant's capital? If the event brings a change of ownership, who can answer for the conduct of this new possessor? He may look with a mistaken view on the subject. If he have purchased the farm, he will perhaps suppose he has purchased it as *it is*, and not as *it was*, before the tenant had employed his capital upon it; and then the latter will have the pleasure of paying interest, in an *increase of rent*, for his own money. Trustees, &c. may be in possession, and it is not improbable that justice to their wards' interests will in some cases overbalance generosity to the tenant. Should the tenant, however, under these circumstances die, what is his deathbed consolation? With him dies that which should have ministered to the comfort of the widow and the fatherless! Alas! this is a case which has been too often verified. Can it, then, be maintained that the system does not check the progress of agricultural improvement? When we look round upon many of the present race of tenants—when we see how they have progressed in intelligence as a body—and when we see what advances they have already made in the practice of agriculture, in spite of this system, we may judge of the improvement which would spread over the face of the country, were the tenant able to make himself *certain* of reaping the reward of his own labour. As it is, however, we may set it down as an incontrovertible fact, that the farmer can never benefit, as he ought to do, by modern improvements, until he becomes a *free agent;* and *that* he never can be, while another possesses absolute power over his capital. Whether or not this power is used it is the same; he can have no real confidence while open, as we have shewn, to so many contingencies, the advent of any one of which robs him and his family.

When we take these things into consideration, and connect them with the peculiar disadvantages that the farmer has to contend against; when we reflect that, under the most favourable circumstances, his ordinary outlay of capital is two years before it returns to him with any interest; that this capital is at the mercy of fickle seasons from one end of the year to the other; that he has, after all, to stand the chances of the market (which are all the risk those in trade run), viz. the rise and fall of prices, and the chance of good and solvent customers; and that, in addition, under the year-to-year tenancy, he has no certainty but that the talent which *he* invests may be taken by another, there is no wonder that he should be slow to adopt improvements, or that he should be loth to put more in his farm than he can recover again in a short time. Indeed, under such a system, we *must have* a large proportion of bad farmers. The bold and intelligent man cannot prudently carry out all that he knows; he cannot depend upon the future, and he is compelled to decline those *permanent outlays* which, in the course of time, would be of permanent profit, and to turn his attention merely to the *exigencies of the present*. On the other hand, the fearful and anxious tenant manages, as it were, from hand to mouth, invests no capital that he cannot call back *quickly*, and seems always ready for the worst. Under these conditions, therefore, the farmer is a speculator upon terms peculiarly disadvantageous. He has difficulties known and certain, greater, as we have shewn, than any other trader; but, as a tenant-at-will, he has an *uncertain* one which represses his exertion the most. The former he sees, and prepares to grapple with; but the latter hangs over his head like the sword of Damocles, and he fears it may come upon him when he least knows. Under its influence, therefore, all his efforts are paralyzed.

Such, then, is the grand evil of the present prevalent system. It gives no security to the tenant for his money; he is bound to risk his capital in the face of many contingencies, or to make as few outlays as possible; and the consequence, as we have shewn, is, that where one has the blind faith to employ his capital liberally, there are ten whose caution conquers the spirit of improvement altogether.

There are other evils, also, attendant on this system, which are not unprevalent. One is, the facility which it affords to men without skill or capital to get farms; and another, the temptation it holds to the needy man to make a temporary convenience of a farm. Thus, as regards the first, how often, on the occasion of any farm's being at liberty, do we see a dozen or more applicants, who know nothing of its nature, or of the capital it requires, hurrying to the agent to take it, on the presumption, that if the late tenant paid the rent, they can. Thus, they often *bargain in haste, and repent at leisure*. It is in this way we see tenants with a capital of L.500 upon a farm that requires L.1000; for, as the occupier is a tenant-at-will, there is not generally that investigation into his qualifications which there should be; and, on his side, he is often impelled to take hold of an engagement, though not to his mind exactly, as a *convenience, and till he meets with something that suits him better*. The result of these contracts may be easily defined. If the farm be out of order at first, the tenant, who takes it as a convenience (*i.e.* on the determination to get all he can from it without much cost) soon finds that it won't bear robbery; but he finds out, also, that it won't do to expend money in it; he is therefore content to take what it gives, and to return it nothing; and he robs it, or it robs him, till after a time there is no more left to rob. In the other case, the tenant finds himself on a farm with a supply of cash below the demand, his farm wants improving, but "it must be done bit by bit, he must see how it answers," are his cogitations; and, of course—as under this sort of management, it grows worse—his land goes half stocked, his crops fail, and he finds himself in difficulties before he knows how to turn himself, the capital he had has melted, and that without making any reform in the condition of his farm, and, in a short time, he is left penniless, and in the possession of a farm which, after such a course of negligent management, requires a capital double of what it ought to do. He has, however, courted the embrace of the bear, and it will not permit him to escape till the breath is squeezed from his body. These are not supposititious cases. So much, then, for the evils of the system we would abolish. The advantages of the one we advocate may be stated to be, the prevention of those very evils which the other produces. Thus, let us remove from the tenant his doubts, let us secure to him, or his family, the interest of his own capital, let us afford him a moderate length of tenure, and—by thus making him independent of any little *contretems* which may happen, and by giving him time to rally against any unexpected contingency—we give him a confidence which will teach him to make the best and quickest of his capital in the permanent improvement of his farm. What is necessary will then be *politic*. There will be no anxiety in making the outlay—no fear of reaping the benefit of it. He will then look rather to a *sure* return than a *quick* one.

Before, too, a contract was entered into between landlord and tenant, for a period of fifteen or twenty years, there would be enquiries made on both sides which would prevent much of one evil of which we have complained. The landlord would require from the tenant respectability, intelligence, capital adapted to the farm, and the necessary practical skill to employ it properly; and the tenant, before he concluded his agreement, would study the nature of his farm, weigh over its necessities, measure his own ability to meet the outlay required, and seek from the landlord such aid as was requisite to put it into proper order for his occupation. But *after* the bargain was completed, it would not be the principle of the tenant to *wait to see if his farm would pay*, before he laid any capital in it, but to endeavour to *make it pay;* and this could only be done by striving to alter and amend whatever was wrong in its condition. Moreover, as he would have no fear in investing his capital, all these improvements he would make *quickly*, in order to have the benefit of them as *soon*, and for as *long* a period, as possible.

For these reasons, then, it appears to me that an alteration of the tenure by which farms are so frequently held, would be of high importance to the progress of agricultural improvement; but if that alteration be from the year-to-year plan, to a system of leasing, it is impossible, in my opinion, to do any thing that will, in a greater degree, promote that progress. The process by which I arrive at this conclusion may be thus summarily stated.

To give a man a temporary and uncontrolled right over his farm, and a reasonable security of tenure, is to give him *confidence;* and to make the taking of a farm a matter of consequence and consideration, both on the part of the landlord and the tenant, is the best way to get a farmer with *skill and capital adapted to his farm.* And, without a farmer has *capital* to expend, *confidence* to make him use it, and *skill* sufficient to use it properly, we cannot expect to see his farm benefit, as it ought, by the improvements of modern agriculture.

But every rule has its exceptions. I do not mean to assert that all tenants-at-will are bad managers, or are wanting in sufficient confidence to allow them to expend capital in improvements. On the contrary, I know many, very many, first-rate farmers, who are tenants merely from year to year. They have confidence, in many cases, to look forward, and to make a present and temporary sacrifice for a future and permanent good. But, then, as tenants, we may say, their lines have fallen in lucky places, or they could not do this. As it is, however, we may safely *doubt* the wisdom, in a worldly sense, of these outlays, when so many circumstances, as I have shewn in the preceding pages, may interfere to rob the tenant of both capital and interest. But although in these cases we may *doubt* the policy of such a use of the farmer's capital, we may rest *sure* that if he, in some cases, *does much without security*, he would, *in all cases, do more with a security.* Let it not, however, be thought that I would infer that there are no landlords worthy of the confidence of these liberal tenants. I know many, indeed, who would scorn to take advantage of a conduct which is their pride; but, then, as I have before said, a landlord, as an individual, is open, along with the tenant, to many contingencies which may affect their relation to each other; and if there are some farmers who, with these in their view, *can speculate* upon their farms, there are, I am equally well aware, *many more* who cannot divest themselves—however amiable or estimable a man their landlord may be—of an instinctive or intuitive caution, which keeps them from vesting capital without *real*, as well as *apparent* security. They are, consequently, much worse farmers than they would be, were they secure, for a series of years, by a lease.

A quotation which I have just met with, exhibits still more fully the value and necessity of security. Thus "*All the great operations of the husbandman have a prospective result as regards the profit to be derived.* The capital expended in such cases is only to be drawn back by periodical returns, after *the lapse of time.* In the providing of extraneous manures, in the adoption of rotations of crops, which to be effectual must be extended through many seasons, in the draining of land, and the like, time is necessary, both to effect the operations, and to *recover, with a future profit, the capital employed.* A landlord will scarcely fail to experience that, if there be not a sufficient period of secure possession accorded to the occupier, the necessary expenditure on the cultivation of the ground *will not be hazarded;* but, more than this, a person of good capital will, *like every trader,* regard as a benefit the power of carrying on his business undisturbed, and will set a *pecuniary value on security and independence.*"*

One objection, which I anticipate, to the extensive letting of farms on lease is, that it would make the farmer too independent,—*i. e.* it would destroy the influence of property, and give the tenant too much control over his land, so as to enable him to neglect or rob it.

In reply to the first part of the objection, I have only to say, that if, by the influence of property, is meant an absolute, and, in many cases, consequently, an arbitrary command over the tenant's property, and an unlimited hold upon his free will as a farmer, and his opinions as a man,—such an influence, in fact, as appertained to property in the feudal ages,—the system *would* operate to diminish that influence. That, however, it would injure that fair and legitimate influence which the owner ought to have over the cultivator of the soil, I deny. The *source of a landlord's legitimate influence is not his power to do evil, but his ability to do good;* and I do believe, much as the landlord's influence is apt to be sneered at, that, in the agricultural districts, at least, where it depends upon the former in *one* case, in *ten* it springs from the latter feeling. Indeed, the connexion between the landlord and the tenant is too intimate, their interests are too much alike, and the value of a good understanding at all times too apparent, to cause any diminution of the landlord's *proper influence*, or any abuse of the tenant's temporary power, under the lease system.

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* Quarterly Journal of Agriculture, vol. i. 795.

That his temporary power, or independence, would lead the tenant to neglect his farm, is equally unlikely. His own interest is guarantee sufficient that he would not injure his land by improper management, during the earlier years comprised in his lease, while an effective stipulation, or covenant, would guard the other and latter years. Thus, say we let a farm on lease for twenty years, the plan would be for the tenant to manage as he thought fit for the first sixteen years (a few injurious crops, according to local or natural disadvantages for such, perhaps, excepted), but to be compelled, by a precautionary covenant in his lease, to pursue a certain course of cropping and of tillage for the *last four years*.

Upon this plan, if a tenant's system of management was a good one, he might have his lease renewed at the expiration of the sixteen years, when he would be at liberty to pursue his own system, and the compulsory clause would *never come into operation*.

In every lease, however, as few stringent covenants as possible should be introduced. In several Farmers' Clubs, where the subject has been discussed, it has been the general opinion, that they "merely retard and annoy the good farmer, and rarely improve the unskilful."* Indeed, then, so far from it being an objection that the farmer would be "*too* independent," we may safely assert that he cannot be too much so. Thus we know, that, as a tradesman, his speculations should be perfectly voluntary. A compulsory purchase, or a compulsory sale, is always attended with a sacrifice. Every fetter, therefore, which at all interferes with the farmer's search after the latent treasures of the soil, injures or prevents his success.

Had an act of Parliament, passed fifty years ago, ordained that all letters should be sent by, and that all travellers should make use of the roads and coaches then in existence, and none else, from that time henceforward, with what contempt should we now look back upon such a piece of legislative wisdom! How soon would it have been repealed! Is it more rational, then, for us to bid the farmer make "all speed" to the goal of improvement, and yet to forbid him the use of his eyes in search of the shortest path?

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* Johnson's Farmers' Encylopædia, p. 738.

But it will, perhaps, be urged that the farmer will, under a lease of fifteen or twenty years, be too much affected by a depression of prices, unless his contract be a very advantageous one; and that, under such circumstances, he will not be able to procure any relief from his landlord.

The first position is a gratuitous assumption, and, even were *it* true, the latter is a decided *non sequitur.* Thus, if it is reasonable to suppose that any man would be so mad as to take a farm upon lease, at the price of productions *for one year*, it is just as likely to presume that any landlord would let a farm for a series of years, at the low prices of another season. It is as fair to infer one as the other; therefore the chances are equal. Before, however, a lease of a farm is given for such a period as twenty years, the quantity of produce is estimated, and the gross value of the same ascertained at the average prices of a *number* of years. From this a certain fractional part—(⅕th is generally about the mark)—is reckoned for the rent. The remainder is calculated to belong to the farmer for tithe, rates, taxes, labour, maintenance of family, mechanics' bills, losses, interest of money, &c. And before a farmer agrees to these terms, it is his duty, also, to estimate the products of the farm, to find their value from the average of other years, and then from the gross amount to deduct the cost of his labour, household expenses, taxes, tithes, rates, and other incidental charges; when, if he has a balance adequate to the rent, he, of course, comes to terms. It is true, that it is a serious business, and one of risk; but a great deal of this risk depends upon the judgment of the farmer, and the fault of his judgment is not the fault of the system, should he make a dear bargain. There is a similar chance, however, of taking a farm at too dear a rent from year to year, but this is no rule;—*no system can be made to protect those who have not knowledge enough to keep out of danger.*

But, then, it is said that the lessee cannot procure any relief from his landlord. This, as I have said, does not follow at all, even if we allow the former part of the objection. It is true, that he is not able to say, "you *must* reduce the rent of my farm, or I must leave it;" but, still, he can at any time ask for relief; and, as the power of giving is as much at the option of the owner in one case as the other, there is an equal probability of success. There is, however, no necessity for us to *assume* that this demand would be made, except where misconduct or ignorance had operated upon the lessee (and both are companions, which bring their own rewards along with them, and no law can or ought to prevent the infliction of the same), for, in the generality of cases, the very serious nature of the contract, its duration, and the consideration required before any one would become a party in so responsible an engagement, is sufficient guarantee that no hasty conclusion would be come to; but that a contract, which was to be in force for a length of time, would be *based upon the prices of products for a number of years past.* In this case, therefore, fluctuations of the market would not derange the calculations of the lessee,—the conditions of his agreement preparing him for the rise and fall. But there is another safeguard against bad times, which the holder of a lease possesses. When he takes a farm, in the manner I have detailed, he values the gross products of the same, not at what it will produce by his superior management, but at what it does produce at the time being, or at what it is calculated to produce in its *present condition.* If, therefore, he can, by superior skill, make it produce one-fourth more than it did formerly, his lease ensures him the benefit of it, and encourages him to continue his improvements; and, when a depression of the market takes place, if his produce does not fetch so much as it did once, he finds that he has more in quantity, so that the aggregate value shews still in his favour; but should brisk markets come, he has both good prices and an increased quantity of produce.

There is, however, another method of determining the annual rental under a lease which is extensively used as a guard against fluctuations, *i. e.* by a sliding scale, regulated by the price of grain, &c., for the year past. Thus a farm is estimated to produce a certain number of bushels of corn per acre, and to pay a certain rent-charge, when wheat sells at 8s. per bushel; but should the price fall to 6s. per bushel, the landlord's rent falls in the same ratio; for it is obvious, that the gross value of the produce will decline in the same measure. By this means the farmer is partially protected. To this it has been urged that, if it does good at one time, it does evil at another; for, since high prices are not only caused by increased consumption, but also by decreased production, when the price of grain gets up, owing to a deficient yield or a bad harvest, the farmer will have to pay an increased rent. This may, in the opinion of some, be a fatal objection. To these, then, the fixed system recommends itself. In my opinion, it is by no means impolitic to endure a small evil for a great good, and we should remember, that, by the system of corn rents, the farmer has three out of the four points in his favour. Thus, if prices are low, from a *limited demand*, he has a reduction of rent.

If prices are low, from an *increased production*, he has more grain, yet, at the same time, a reduced rent.

If, on the other hand, prices are high from an *increased demand*, he has a higher rent to pay; but then he has more money to pay it with; for as the rent is but, say, ⅓th of the produce, the owner only gets ⅓th of the advance in price.

And it is only when the advance of price arises from a *decreased production*, that it operates against him. Then he has a higher rent without any advantage of market; for it is probable that the advance of the *value* of his grain is more than counterbalanced by the *diminution* of the *quantity*.

But it should not be forgotten that this diminution in the quantity of his grain is not *all* "*loss*" to the farmer. His original rent is founded upon the presumption that his land will grow a certain quantity per acre; but this quantity is the average of a number of years; so that, if one year he *falls short* of the quantity, it is reasonable to suppose that in other years he *exceeds it*. When we consider, too, that he is, or ought to be, making improvements, it is fair to presume that he exceeds the estimated quantity upon which his rent was originally based, much more frequently, and more largely, than he falls short of it.

But a truce to these objections. Whether the sliding or the fixed rent may be preferred is a matter of no importance compared with the great question itself,—lease or no lease. And in canvassing the various *minutiæ* connected with the two systems, to endeavour to refute one system at the expense of the other is useless; for both can produce evidence worth more than a volume of opinion—*fact*. Both have been in operation, both are now so, and the beneficial effects of each require no commentary. But, indeed, in advocating by argument, founded merely upon reason, the extension of the system of letting lands by lease, as a means for promoting the improvement of agriculture, we can bring no proof of the truth of our position so conclusive as that which is open to our eyes. Turn them, then, to Scotland, where the system is and has been at work largely, and for a length of time, and what is the result? We see a country which, with the greatest disadvantages of soil, climate, &c. to contend against, has become the nursery of agriculture. We see a race of farmers intelligent and contented, and, not only able to contend with their more southern neighbours in the market, but actually to shew them the example in every thing which tends to the improvement of the science they practise. Nay more, we see a class of farmers who, with all their local disadvantages, have actually been able to endure, without flinching, the pressure of times which almost annihilated the agriculture of England. These are not mere assertions. A reference to the evidence of Scotch agriculturists, given before a Committee of the House of Commons, appointed in 1836, to enquire into "Agricultural Distress," will prove all that has been asserted—and more. It proves that this state of things has been brought about by the *adoption of the lease-system and corn-rents*. Thus, from the evidence of Mr Hope, Mr A. Howden, Mr J. Brodie, Mr Oliphant, Mr Bell, &c., we learn that the corn-leases had saved them from injury during the years 1834, 5, 6, &c., when prices were very low; and that, at that time, the condition of the farmer was satisfactory,—that improvements were progressing,—that these improvements would not be made, had they no leases,—that, especially in the Lothians, the state of agriculture had improved, and that it was owing to a change to leases on corn-rents. The evidence of one farmer, Mr Robert Hope, the first in the list, shews this, as well as the whole volume. Thus, we are told by him, that he farmed 650 English acres,—that in the last twenty years he had deep-drained a great part,—that since 1793 it had been all *deep-drained*,—that he had limed the whole farm at an expense of L.9 per acre,—that he had laid out L.240 in furrow-draining during the last two years,—that it could not have been expected that he would have done this without a lease,—and that they had not suffered from low prices, owing to their lease system and corn-rents. He tells us, too, that there were then about sixty-three or sixty-four steam-thrashing machines in the county.

The evidence of every other agriculturist is corroboratory of Mr Hope's,—all shewing great improvements, all declaring themselves pretty prosperous, and all ascribing it to the protection afforded by their leases upon corn-rents.

The able sketch of the Agriculture of Fifeshire by Mr Buist,* affords us an equally satisfactory proof of the value of the system. " The length of leases," says he, " allowed in Fifeshire, is now almost universally restricted to nineteen years. The rent is, in a great proportion of cases, made payable by the fiars prices of grain. The tenant is now left at liberty to treat his ground as he may think fit, during the earlier portion of his lease, so as to give full scope to the employment of his industry, capital, and skill. He is, towards the closing years of his occupancy, bound merely to such a system as may prevent him from scourging the ground, so as to protect the interests of the proprietor." The result of this system will be seen, in the " more judicious system of arrangement in reference to rotation,"—in the spread of all the novelties of science, and the application of the skill of the modern mechanic (in the erection of steam-thrashing machines and in the improvement of the implements of agriculture),—in the extensive outlay made by the tenant in draining, &c.,—and in the management of various fertilizers (especially yard manure), which Mr Buist states to be common to the county.

But we are told that the condition of the cultivator has made an equal advance; that " the very happiest condition in the relations of landlord and tenant exist; that the proprietors themselves being mostly resident, and skilled in agriculture, can adequately appreciate and sympathize with his tastes, habits, and pursuits;" and that, at the same time, " the farmer himself is neither ignorant nor excluded from the more *elevated sources of intellectual, sentimental, or social enjoyment*."

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* Quarterly Journal of Agriculture, vol. xi. p. 296.

Here might we close, with this admonitory hint, that if landowners would see the same results generally diffused, they must use the same means; but we are reminded, that England herself is not without voices that cry out for the change. It is not necessary for us to look round where the landlord cannot, and the tenants dare not, expend money in fertilizing the soil. It is not necessary to note where the owner's absence, ignorance, or extravagance chills the efforts of tenants in the work of improvement,—where the good "old English gentleman" has been succeeded by the stranger spendthrift, and the tenant's improvements are made to minister to his extravagance,—where the speculating purchaser has made his investment a good one, at the expense of those farmers whose liberality best deserved his praise,—where the loss of the husband has brought a loss of all; and the stranger has gathered the harvest that should have been reaped by the children. No; these are cases which require not to be particularized. When felt, or seen, no other evidence is needed to teach us that there should be a change; for one such example, I hesitate not to say, is sufficient to put a stop to the improvements,—in fact, to draw the purse strings of a thousand tenants-at-will.

But no more conclusive evidence of the evil operation of the year-to-year system, and the beneficial results of that we advocate, can be offered, than that which is afforded us in the "Report of the Evidence given before a Committee of the House of Commons appointed in 1836, to inquire into the state of Agriculture." From this, as we have before shewn, we learn that the Scotch farmers all stated themselves to be in a prosperous condition, and that this was chiefly *owing to their leases permitting them to make improvements*, and to their corn-rents *saving them from the effects of low prices*. On the other hand, the English farmers declared themselves generally to be in a bad condition, and that agriculture was, in many places, deteriorating owing to the low prices of preceding years.

We have here both effects and causes. Is it not reasonable, then, upon such evidence, to assert that a system which produces such beneficial effects in one case, only wants trying to do the same in the other? But we have sufficient positive as well as negative proof of this, even in England. Many enlightened proprietors have already partially adopted the system, and even on these isolated cases, I am content to rest the issue of the case. For one bad farmer, upon a recent lease, I venture to say we shall find ninety-nine who are superior to their neighbours who are tenants from year to year; and it is only by comparing the two that we see the operation of each principle. Often, in such cases, where a farmer has his farm upon lease, in a district where they are uncommon, when his management is commended, it is urged, that "*he has a lease—his farm's like his own, and he can do as he likes.*"

If particular cases in point are required, I would refer the reader to the estates of the Earl of Leicester, and to a little work on the "Connexion between Landlord and Tenant," by Mr G. Webb Hall, for an account of their condition.

The estates of the Earl of Ducie are another example of the working of the system. The result of the trial may be gathered from his own estimate of the importance of the question given at a meeting of the Gloucester Farmers' Club.

"His opinion was, that till the question of leasing was fairly and clearly understood, *all their efforts after improvement would fall short of what they ought to be.*

"For himself, he could say, that he never wished to see any man enter upon a farm *without a lease;* but, in return, he (Lord Ducie) must have intelligence. He would not give a lease to one of the old school,—a man who, because his father and his grandfather did so and so, refused to change. To a man of intelligence, on the other hand, he would give the most liberal encouragement.

"He was sure it was a most mistaken idea to suppose that their landlords would take advantage of their tenants, and raise their rents whenever there was a rise in the price of corn, still he would regard the tenant *as a fool who would sink money without the protection of a lease;* because, however much confidence he might have in the landlord, he had *no security* for similar treatment, in the event of a son or trustees becoming the managers.

"*No man*, in his opinion, *was justified in expending money in* *improvements, unless the value was secured to him, and to his children after him, by lease.*"

But we have now given sufficient, both of reason and of fact, to prove that the change we advocate is one that would tend greatly to the advance of agriculture. It only remains, therefore, for us to say, with the noble Earl, whose opinion we have quoted above (an opinion the more valuable because it is founded upon experience), that "*until the question is fairly and clearly understood, all our efforts after improvement will fall short of what they ought to be.*"*

Although I have already written at length, I cannot close this paper without making a suggestion to those *who will not give leases;* for I know, with Hudibras, that,

> "Convince a man against his will,
> He's of the same opinion still;"

and, therefore, though I could make out a case ten times stronger than I have, it would be of no avail with some. To these, then, I would say, "Let no private feelings cause you to neglect a public duty—the improvement of agriculture. If you don't feel disposed to give your tenants a reasonable security for the extra outlay of capital required to improve their farms, *take the work into your own hands, and charge a fair per-centage for the money you have expended.*" There is not a tenant in England but would pay it cheerfully; for if he can pay the present rent without the improvements, he would be better able to pay the increased one with them.

Let it not be supposed that I recommend this plan as a substitute for leases. By no means so. It is offered merely as a compromise, to those who *will not* give leases. And, if accepted—if only acted upon in all cases where the tenant has no lease; and acted upon promptly (and it is in the power of the landlord so to do), I need scarcely say that even this suggestion is of some importance at the present time,—a time when the production of an *extra* bushel of corn, by an *extra* application of capital and skill, providing, as it does, an *extra* supply of food, and an *extra* portion of labour to our increasing population, entitles any man to the proud distinction of a ***public benefactor***.

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* Since these sheets went to press, Professor Johnston has given to the world an able answer to the question, "*What can be done for English Agriculture?*" and to it I would refer the sceptical reader for further illustration of the value of the "means of improvement" which I advocate.

ON INSECTS MOST INJURIOUS TO VEGETABLES AND ANIMALS, AND THE MEANS BEST CALCULATED TO COUNTERACT THEIR RAVAGES.—NO. XII.

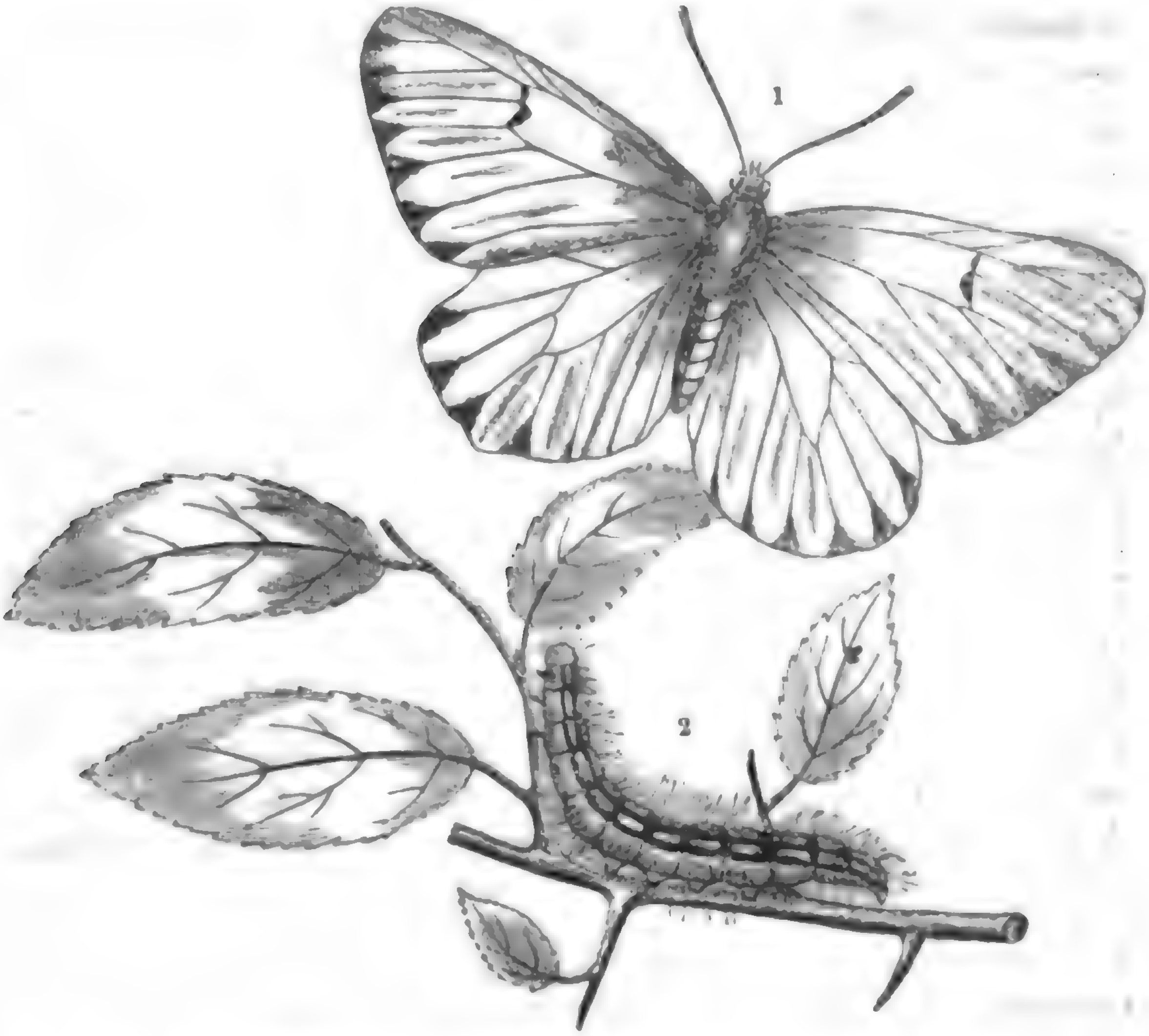
By James Duncan, M.W.S.

There are fortunately very few insects among the diurnal lepidoptera or butterflies, to which we can impute much blame as interfering with the productiveness of our fields and gardens. We can, therefore, in general, permit them to multiply unmolested, and admire their gay colours and sportive flight, unalloyed by the reflection that they are the cause of injury to us. The chief exceptions to this innocuous character, are the white garden butterflies already described; and there are two or three others so far resembling them, that we cannot avoid noticing them in this place, although their depredations in Britain, and more especially in Scotland, are by no means of a serious description. The first of these is—

The Black-veined White, or Hawthorn Butterfly. *Pieris Cratægi*. *Donov. Brit. Ins.* xiii. *pl.* 454. *Lewin's Papilios of Gt. Britain*, *pl.* 34. This butterfly, at first sight, somewhat resembles the garden whites, as they are called, but may at once be distinguished by the black and conspicuous wing-veins, and more precisely by the following characters. The antennæ are rather slender, and the club is formed gradually; the palpi have the two lowest joints robust, the radical one twice the length of the second, the terminal one about the length of the second, and very slender. The upper wings are nearly diaphanous, being very sparingly clothed with scales. It is nearly the size of the common cabbage butterfly (*P. Brassicæ*), the wings somewhat transparent, the nervures, as well as a narrow line round the outer edge of the wings, black. There are generally a few dusky triangular marks on the outer margin of the upper wings. (*Woodcut, No.* 1. *fig.* 1).

The butterfly appears pretty early in spring, and lays her eggs either on a hawthorn shoot, or on the leaves and twigs of apple-trees. They are of a bright yellow colour, cylindrical, but somewhat narrowed at both ends, and ribbed longitudinally; coated with a strong varnish which renders them weatherproof, so that they remain in security (sometimes, it is said, for years) till circumstances favour the exclusion of the larvæ. That takes place commonly in a fortnight or three weeks after the eggs are laid; and, on their first appearance, the caterpillars are of a dull yellow, the head and neck black, with a brown stripe along each side, the body pretty thickly beset with hairs. After the first change of skin, two rows of yellow spots down the back make their appearance, with a black line running between the rows. The back is now covered with yellow and white hairs, and there are oblique ash-grey stripes on the sides. Another change in the distribution of the colours likewise follows the third moulting, there being a black stripe in the middle of the back, on each side of

No. 1.



that a yellow stripe, and beyond these another black stripe (*Woodcut, No.* 1. *fig.* 2). The change into a chrysalis usually takes place about the beginning or middle of May, and the duration of that state is about three weeks. The chrysalis is yellowish white, thickly spotted and striped with black. It is attached by the tail and a silk thread round the middle.

The caterpillar is a pretty general feeder, but never frequents herbaceous plants. The leaves of the arborescent Rosaceæ, particularly the common hawthorn, sloe, pear, and apple-trees, form its principal food; and it is, of course, on the two latter of these that its depredations are most to be apprehended in an economical point of view. The caterpillars live in society under the protection of a silken web, their habits in this respect resembling those of certain moths which we shall soon have occasion to notice. The following account is by M. Schmidberger, canon of St Florian, who has had ample opportunities of examining this insect in different parts of the Continent, where it is often very destructive, appearing in such numbers that, on one occasion, a celebrated traveller took the flights of the butterfly, at first sight, for a shower of snow. "As soon as it began to rain, the young caterpillars drew the leaf together over them by means of a web, and, on the 21st of July, a covering was ready, under which they were quite sheltered during continued rain. In the meanwhile, they enjoyed the food which the epidermis of the leaf afforded; and they gnawed it entirely off, so that nothing remained but the veins. In six days they were obliged to look about for another leaf; they accordingly added the next leaf on the same shoot to their abode, connecting it with a web. After this task was accomplished, they removed to the new leaf, to feed upon that. About this time they underwent their first change of skin, on which occasion they varied but little in point of colour. They always returned in the evening to their nest, which was formed of the leaf drawn together and covered with a web, as they arranged it when they first came out of the egg. They fastened the leaf immediately to the shoot with threads, that it might not fall off. When it rained, or when the sun was very hot, they retired to their nest, which was so well contrived that not a drop of rain could penetrate it. As the caterpillars increased in size, they required more nourishment. They in general consumed a leaf in less than two days after their first change. On the 31st of July, they had already deprived the fifth leaf of its epidermis. The leaves of a single shoot, however, when it is strong, generally furnish them with sufficient food throughout the summer, till their retreat into winter quarters; particularly as, during the whole period, their numbers are gradually diminishing. Birds and insects destroy them, and many perish from unfavourable weather. Rarely twenty or thirty out of a family, sometimes much fewer, survive to occupy their winter habitation, which they begin to prepare early in autumn, usually in September, when they cease eating. They generally bend one leaf over another, or bring the edges close together, and unite them with threads, covering the chamber thus formed within with a fine web, so as only to leave themselves a small space to enter at. They also unite the petiole of the leaf which they have prepared for their nest with the shoot by many threads, so that neither wind nor rain may detach it. After this operation, they all return to the nest, and secure it on all sides from wet and cold. As the family at this time is not very numerous, each caterpillar selects a place in the chamber, and makes a web for itself, in which it reposes securely throughout the winter, uninjured even by very severe weather.*

They leave their winter retreat with the first genial weather of spring, and as soon as the blossom-buds begin to expand they attack these, and speedily damage them. They still, however, keep up a general residence, to which they retire in bad weather, or to obtain shelter from the cold of the evening. The nascent leaves, as well as the blossom-buds, are gnawed and mutilated, and at this season a very slight injury to the buds is sufficient to render them unproductive of fruit. Before the leaves are fully expanded, the caterpillars are easily seen, and their tents are so conspicuous that they may at any time be easily destroyed, at least on trees of low growth, and such as are trained on walls. The eggs also may be discovered without much difficulty, owing to their bright yellow colour, and should be rubbed from the leaves and branches and destroyed. The natural enemies of these caterpillars are birds of various kinds (particularly Titmice), ichneumon flies, and, according to Schmidberger, field-bugs (*Cimicidæ*), which pierce them with their rostrums or beaks, and suck their juices.

It is seldom that this butterfly occurs in such abundance as to produce much injury in this country. Indeed it may be said, in some seasons, to be a scarce insect; and, as far as I know, it has never been observed in Scotland. The female, however, is very prolific, and under a concurrence of circumstances favourable to its propagation, we may soon cease to congratulate ourselves on comparative exemption from its visitations. It has appeared in great numbers in the New

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* Kollar's Treatise on Insects injurious to Gardeners, Foresters, &c. Misses Loudon's Trans. p. 185.

Forest, Hampshire, Coombe Wood in Surrey, and not a few other places in the south of England.

The caterpillars of several other butterflies occurring in this country consume large quantities of the plants on which they feed, but these, for the most part, are of no direct utility, or are considered as weeds which it is desirable to destroy. Thus the spiny caterpillars of the common tortoise-shell (*Vanessa Urticæ*) and peacock's-eye butterflies (*Vanessa Io*) attack the two common species of nettle in numerous bodies, and strip them of their leaves, in defiance of the miniature stings with which the latter are so plentifully armed. Of the great number of butterfly caterpillars which feed on meadow and pasture-grasses, few occur in such abundance as to call for any preventive measures. If there be any exception to this, it will be found in two or three species of the genus Hipparchia, which feed on the most valuable of our pasture-grasses, and which appear in great numbers every year, whatever may be the character of the season, and often in such profusion, that they must consume a more or less considerable portion of the herbage, which husbandmen may be disposed to think could be better employed. If, for this reason, we include them in the catalogue of our *Insecta noxia*, the *fama* that may be thereby raised against them will not probably cause them to be unduly persecuted, as the injury they commit is partial and inconspicuous, and although in the aggregate it may be far from inconsiderable, is not very likely to attract attention.

Meadow-Brown Butterfly—Hipparchia Janira. Donovan's Brit. Insects, ix. pl. 320. *Naturalists' Libr. Brit. Butterflies*, pl. xxiv. figs. 1 and 2.—Wings of the female expanding nearly two inches—male considerably smaller; the ground colour brown; upper wings entirely brown in the male, with a small ocellus towards the apex, encircled with reddish yellow; in the female the upper wings have a large transverse patch of ochre yellow below the middle of the wing, in which there is a large black ocellus with a white pupil, and the space between this patch and the base is very obscurely tinged with reddish-yellow. The hinder wings of the male are usually without spots; those of the female have not unfrequently an obscure yellowish mark in the middle. The under side of the fore-wings is tawny-orange, with a paler band not far from the hinder margin, in which there is an ocellus as on the upper side. The same side of the under-wings is tawny-brown from the base to the middle, where the colour terminates in an angular line; the space beyond this is pale, excepting the margin, which is of the same colour as the base. The pale portion has sometimes two or three small eye-like spots of a black colour, and the whole surface seems as if dusted with black.

The caterpillar is light green, with a white line along each side. Although it does not refuse diverse of the common grasses, its proper food is the smooth-stalked meadow-grass (*Poa pratensis*), which enters so largely into the herbage of pasture-lands, and forms one of the most nutritious grasses for cattle. The butterfly appears on the wing about the beginning of June, and, next to the white cabbage species, may perhaps be regarded as the most common insect of its tribe inhabiting Britain.

Large Heath Butterfly—Hipparchia Tithonus. Donovan's Brit. Insects, xii. pl. 405. *The Gate-Keeper, Harris' Aurelian. Nat. Libr., Brit. Butt.*, pl. xxiii. figs. 2, 3. Considerably less than the preceding; the upper wings ochre-red or reddish-yellow, the base brown, the anterior and outer sides widely margined with dark brown. Towards the outer anterior angle there is a pretty large ocellated black spot, with two minute white points in the centre. The hinder wings are brown, with a large reddish-yellow area in the middle, which bears a minute ocellus on the side nearest the anal angle. On the under side the hinder wings are greyish-brown, with a very irregular cross-band of light grey behind the middle, in which there are usually four minute white points approximating in pairs, and surrounded by a brown cloud. The male is much smaller than the female, more deeply coloured, and has a brown cloud in the middle of the lighter portion of the forewings.

This butterfly is very common in most parts of England, and is not unfrequent in the south of Scotland. The caterpillar is of a green colour, with a reddish line on each side, and a brown head. It feeds on the annual meadow grass (*Poa* *annua*), which forms the chief covering of our ordinary meadows and pasture lands.

Some other species of Hipparchia likewise feed on grasses in their caterpillar state; but, as they scarcely ever occur in such numbers as to be detrimental, it is unnecessary to particularise them. It may be remarked, regarding caterpillars that feed on grasses, or grass-like plants, that perhaps the best method of collecting and destroying them, is by using a large triangular net with a horizontal beam in front, which is pushed smartly along the grass, so as to displace the insects and make them fall into it.

There is a tribe of lepidopterous insects, occupying a kind of intermediate place between butterflies and moths, named Hawkmoths (*Sphingidæ*), known by having the antennae prismatic and thickening gradually from near the base to the apex, where they suddenly end in a narrow, usually deflexed point; the body robust; the wings narrow, and fitted for rapid and long sustained flight. None of the members of this section, which is not a numerous one, considered in its relations to this country, fall within our notice on the present occasion, with the exception of a single species, which feeds upon the wood of the broad-leaved willow (*Salix capræa*), and greatly injures growing trees.* It belongs to the genus *Trochilium*, which is remarkable for having the wings, in common with two or three allied genera, so free from scales that they appear clear and transparent; hence these insects are often called clear-wing hawk-moths. The species in question is the *Trochilium crabroniforme, or Lunar Hornet-Moth. Linn. Trans.* iii. pl. 3., fig. 6, 10. *Troch. bombiciforme, Curtis' Brit. Ent.*, pl. 372. It is of a dark brown colour, with a grey powdery substance sprinkled over it; antennæ bluish-black, reddish-

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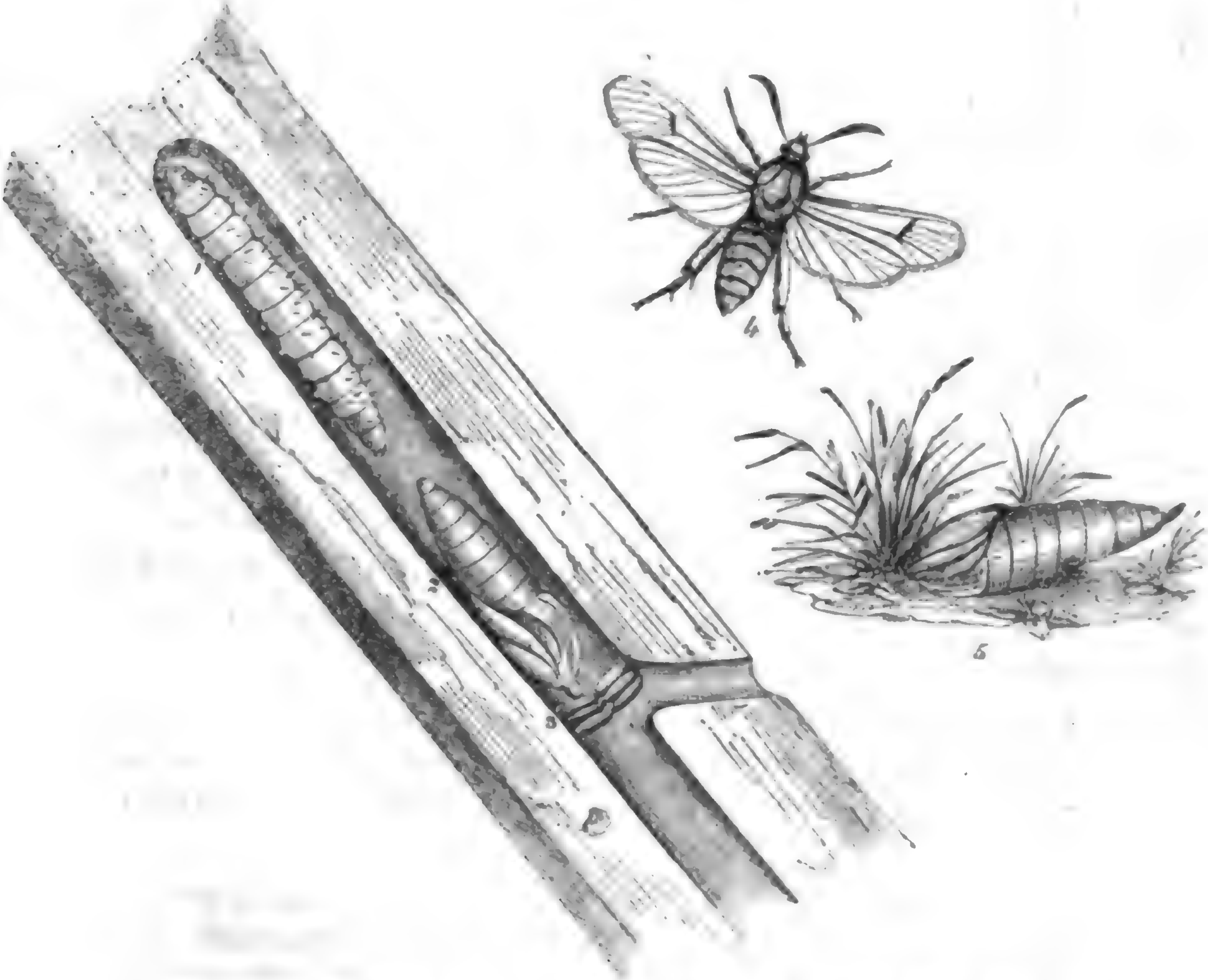
* The genus Ægeria, allied to Trochilium, containing a considerable number of small clear-wing Hawkmoths, comprehends one species, *Æ. tipuliformis*, which is not rare in gardens in some parts of England, and occasionally injures currant bushes, the larvæ perforating the wood and causing it to decay. Another species, *Æ. asiliformis*, is said to have been known to do the same thing to poplar trees. The local occurrence of these insects, and the trifling injury they commit, precludes the necessity of noticing them at greater length in this place. The habits of their larvæ seem very similar to those of T. craboniforme, about to be described.

brown beneath in the male; face silvery white; palpi yellow. The anterior margin of the thorax, and a large patch on each side behind, are deep yellow. The abdomen is also of the latter colour, the apex inclining to orange, the two basal segments dark brown, the hinder margins of most of the segments more or less widely edged with the same. The legs are yellow, clouded with orange, and here and there marked with red spots; under side of the thighs brown. The wings are pale-yellowish, the anterior margin and short transverse nervure near the middle orange-brown, the interior margin likewise of that colour, the base scarlet with a black spot. (*Woodcut*, No. 2. fig. 4.)

No. 2.



The larva is pale and soft, like most of those that feed in the interior of trees, with a dark brown head (fig. 1). It would appear, from the observations of Lewin and others, that it does not enter the wood till the second year of its existence, feeding probably in the mean while on the tender bark of the willow root. This is rendered more likely by the fact that the caterpillar of *T. apiforme* always confines its attacks to the bark, never penetrating into the wood.

It enters the wood near the surface of the ground, sometimes even from the root, and after finding its way into the central parts of the tree, eats perpendicularly upwards, frequently consuming the pith, but by no means generally confining itself to that, as Lewin affirms, but perforating indiscriminately the solid wood. Mr Bree states, that, when the periodical falls of the willows took place, he observed that scarcely a single willow wand was cut down that did not exhibit proofs of the ravages of the insect; sometimes three or four, or even five, separate perforations occurring in the same stem.* The caterpillar changes into a chrysalis within the hole it has excavated, and before undergoing that metamorphoses, instinct directs it to turn itself in its narrow gallery, and place the head downwards, so as to enable the future fly to make its exit by the orifice which is usually opposite to it (fig. 2). The chrysalis has no projecting point at the hinder extremity, while such an appendage is conspicuous in that of the nearly related T. apiforme (fig. 5). That orifice, in the mean while, is closed up by a coarse web of silk (fig. 3). The perfect insect commonly makes its appearance about the middle of July, and although found in great numbers in certain localities, it is by no means generally distributed. We never saw Scotch specimens, although it may be presumed to occur a considerable way northwards. "To the woodman," says the Rev. Mr Bree, in the work already referred to, "our elegant sphinx must be regarded as in some degree an injurious insect. The wood of Salix capræa is with us (that is, at Allesley, near Coventry) usually either sold to the rake-maker, for the purpose of being worked up into rake-teeth, &c, or converted into what are here called flakes, *i. e.* hurdles made of split stuff nailed together, in contradistinction to the common hurdle, which is formed of round wood twisted and plaited together without the help of nails. The lower, and consequently the thickest, portion of each willow rod, to the length of five or six inches, or occasionally a foot or more, is spoiled by the perforations of the larva, and rendered unavailable for the above purposes. It may seem an odd complaint to make, but Salix capræa appears to be a tree of rather too rapid a growth; that is to say, it outruns its neighbours, and comes to maturity before the rest of the underwood with which it is intermixed. If, indeed, the entire underwood consisted of this species only, the coppice would make a quick return, and might be cut at the end of every seven or eight years, or in little more than half the time usually allowed for the growth of coppice-wood. My own practice is, to cut wood at about ten or eleven years' growth. Long before the time comes round for the periodical fall, I observe that on every stool of the broad-leaved willow, most of the rods have ceased to thrive, and many have even died; and I cannot help suspecting that this premature decay may, in part at least, be owing to the injury inflicted at the base of the stems by the larvæ of Trochilium craboniforme."

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* Magazine of Nat. Hist. vol. i. New Series, p. 21.

We now come to treat of the tribe of moths properly so called (*Lepidoptera nocturna*), which is one of the most extensive of the whole entomological circle, and produces, perhaps, a greater number of species injurious, in one way or another, to vegetable produce than any other. Even the perfect insects are remarkably diversified in structure and habits; but this is still more strikingly exemplified in the caterpillars, which vary greatly in external attributes, to such a degree that it requires considerable acquaintance with their general history to enable us to determine, in regard to some of them, whether they really belong to this tribe. By this diversity in their form and appendages, accompanied by corresponding modifications of internal structure, they are more adapted than the larvæ of any other races of insects to different modes of life. We accordingly find among them examples of nearly all the different kinds of economy and modes of existence observed in all the other orders, as well as some others of which instances do not occur elsewhere. They are thus enabled to carry on their operations in an infinite variety of ways, to maintain their existence against every effort hitherto made on our part to extirpate them, or even greatly diminish their numbers, and occasionally to propagate in such hordes as to set at defiance all endeavours to check their depredations. Many take up their abode in the interior of trees and herbs, whence it is difficult to dislodge them without running the risk of damaging the plant; others penetrate into the ground and consume the roots of corn, grasses, and other cultivated crops; some ensconce themselves in the heart of a bud and destroy its substance; some mine galleries in leaves and eat the whole of the pulpy matter; others roll up the edges of leaves by means of a curious arrangement of silk threads spun for the purpose, and make the enclosure serve them both as a tent and provision-store; while the great majority openly devour foliage with a speed and voracity which we have daily opportunities of witnessing. Certain species, in defiance of a host of armed assailants, have the audacity to enter bee-hives, and effect a lodgement in the combs, making them at once their residence and food; and not a few, as is well known, enter our own dwellings and find an agreeable repast in our carpets, peltry, and woollen garments. Even other modes of obtaining a livelihood at our expense will be noticed in the sequel, as we proceed, according to the plan hitherto followed, to sketch the history of such of the species as commit injury of sufficient importance to render it worth while, in an economical point of view, to adopt measures to guard against them.

Wood Leopard Moth. Zeuzera æsculi. Latr. Donovan's Brit. Insects, v. pl. 152.—This beautiful moth belongs to a genus of which the distinguishing characters are the setaceous form of the antennæ, which are not so long as the thorax, and pectinated at the base in the males, while in the female they are simple, that is, without projections of any kind. The palpi are obsolete, the abdomen long and tapering to the extremity, and the tibiæ without spurs or spines. The species named *Æsculi* (not very appropriately, as it seldom selects the horse-chestnut for its residence) is of a pure white colour, the wings very sparingly clothed with scales, the nervures yellowish. The whole surface is rather thickly sprinkled with dark blue spots. The hinder wings are white at the inner angle, and very faintly spotted at the base, but there is a distinct row of spots round the hinder margin. The abdomen is nearly covered with dark-blue down. The wings of the male usually expand about two inches; those of the female are a good deal larger.

The caterpillar is rather large, thick, and fleshy, of a light yellow colour, with a double series of black spots across each segment. The head is strong and wedge-shaped, well fitted to work its way through decomposing wood, and the segment immediately succeeding it is protected by a black scaly plate. The moth appears to lay her eggs on the bark of the tree, and on emerging, the caterpillar penetrates the bark into the soft wood, gradually working towards the centre, where its gallery becomes perpendicular.* The caterpillar is supposed to continue two years in this state. It undergoes its transformations in a strong web, near the outer part of its excavation. The pupa is brownish-yellow, dark brown at both extremities, with short wing-sheaths, a projecting point on the head, and transverse rows of serratures on the back of the segments.

The moth occurs throughout all Europe, but cannot be considered common in this country. In some seasons it has been noticed rather plentifully in the vicinity of London; also in Cambridge, Norfolk, Surrey, Essex, &c. All the edible fruit bearing Rosaceæ are liable to its attacks; pear and apple-trees are perhaps most frequently selected.

Goat Moth. Cossus ligniperda. Curtis's Brit. Ent. ii. pl. 60. *Nat. Libr. Brit. Moths*, pl. xiv. fig. 2. The genus *Cossus* has antennæ the length of the thorax, pectinated on the inner side; the palpi distinct and three-jointed; spiral tongue wanting; upper wings very large. The species in question is the only one found in Europe. It is one of the largest of our native moths, measuring from three to three and a-half inches across the wings when expanded. The colour of the upper wings is ashy white, clouded with brown, and marked with numerous narrow black streaks, which are waved, and frequently cross each other, forming irregular meshes; hinder wings brown, with faint reticular black streaks towards the hinder margin. The head and back of the thorax are brown, the latter ochre-yellow in front, and whitish behind, with a transverse black band; abdomen brown, the segments with a greyish-white border posteriorly.

The abdomen of the female is elongated at the extremity, and attenuated into a kind of ovipositor, by means of which the eggs are more easily attached to the bark of trees, deposited in holes, fissures, &c. They are always placed at the lower part of the trunk, near the root, and one laying (which is all that one female produces) generally consists of about a thousand. These eggs are of small size, considering the di-

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* One of these galleries in the trunk of a pear-tree is figured in Loudon's Arboretum, p. 887.

mensions of the insect which produces them. The young caterpillars merely penetrate the bark at first, and live for a while between the outer and inner bark; but as soon as they have increased in size, and acquired strength, they enter the solid wood, and perforate the trunk of the tree in all directions. When full grown, the caterpillar is about three inches long, of a lurid red colour, slightly tinged with dull yellow, and having a patch of chestnut-red on the back of each segment. The head is entirely black, and there are two triangular spots of the same colour just behind it. The surface of the whole body is smooth and shining, with single short hairs projecting here and there. The jaws are very strong, each blade short and broad, the internal edge armed with strong and triangular teeth. The action of these powerful instruments on the wood, is aided by an oily looking corrosive fluid which exudes from the mouth, tending to loosen and soften the fibres. The combined operation of these two agents is quite sufficient to overcome the resistance of the hardest wood with comparative ease. It is probably this fluid, in part, that causes the peculiar smell for which this caterpillar is remarkable, and from which its English name is derived. This scent is sometimes so strong, that it can be felt at some distance by a person passing the trees infested by the larvæ. These seldom leave the tree in which they at first took up their abode, provided it remain in a condition to supply them with proper food and shelter. They continue in the caterpillar state between two and three years before making any preparation for pupising. When that change is drawing near, the colour becomes light ochre-yellow, and a strong oblong cocoon is constructed, coated over externally with what the Germans call worm-meal (that is, the small particles of gnawed wood), chips of wood, and small pieces of bark. This cocoon is always placed within a short distance of the opening in the tree, to facilitate the egress of the moth. This, however, is principally accomplished by means of a series of transverse serrated ridges on the back of the pupa, directed towards the tail, which enable it, after the opening of the cocoon, to work itself forward by a kind of wriggling movement, to the very mouth of the aperture, from which a portion of the case is usually seen projecting when the moth has made its escape. The duration of the pupa state is longer or shorter, according to circumstances. The moth usually appears in June or July, but is seldom so plentiful as might be expected from the numbers of the caterpillars.

"In the autumn of the year 1827," says Mr Knapp, "the larvæ of the goat-moth abounded beyond any customary proportion, and we could commonly see the trace made by these creatures in the dust. They had apparently fed during the summer in the earth, and were now proceeding in search of a retreat during winter in some old hedge-row tree—a part to repose, and those which approached maturity to abrade the softer wood, and form their cases, preparatory to changing to a final perfect state in the spring. At times we observed them coursing along our paths with great strength and activity; and when not seen, that peculiar subtile smell which proceeds from them, and has been thought to resemble that of the goat, was perceptible in all our walks. * * * With us they chiefly inhabit the ash; and we very commonly see at the roots of our aged trees, the fragments removed by them in forming their passages. In breaking up the decayed pollards, we not unusually find the grub in all the stages of its growth, but more generally observe them without inhabitants, yet perforated with paths large enough to admit the finger. I suspect that these 'auger-worms' are the primary cause of the decay of the tree; having often observed their perforations, and found them, both large and small, in the solid spur or root of the tree, when the upper portion, having been bored, and in a state of decline, is abandoned by them. Those that are full fed, appear to form their cases in that part which has lost coherency; while the younger and imperfected creatures mine their way, and obtain nutriment in the solid timber, thus killing the tree by inches, when rain and moisture find lodgement, and complete the dissolution. One year's preparation is the period usually assigned to the larvæ of most insects before they arrive at their perfect state; but by the goat moth, three years are required before it attains its winged state from the egg. Consequently, for the larger portion of its life, it is occupied in these destructive operations; and thus this creature becomes a very powerful agent in reducing these Titans of the vegetable world, crumbling them away to their original dust; for what was decreed to be the termination and punishment of man, is found in active operation throughout the whole chain of Nature's work, which are but dust, and unto dust return, continuing an endless series of production and decay, of restoration, and of change. All these larvæ which I have observed in the colder portions of the year, were hard, stiff, and torpid, but soon became relaxed and animated by the warmth of the hand; thus they probably remain quiet during the winter months, but revive in spring, and recommence their ravage in the tree. The caterpillar of this moth I believe to be the largest of any of those of the British lepidoptera; and, when full fed, exceeds in size that of the death's-head sphinx. To those who dislike the appearance of things of this nature, it is particularly disgusting, not only from its magnitude and smell, but from its colour, which is a livid red, so compounded with a dingy yellow, as to give it a lividness of look, conveying the idea of something raw. Common as the grub is in some years, I have seldom been able to obtain the moth without the often tedious process of feeding the larva and waiting for its change."*

In this country the goat-moth is principally found in the southern counties of England; we never heard of it having been noticed in Scotland. On the Continent it is plentiful in many places, and multitudes of the finest trees are annually destroyed by it. It has been particularly destructive to the elms in the vicinity of Paris. Indeed the elm seems to be rather a favourite residence for it, although very few of the timber-trees of this country are exempted from its visitations. Owing to it being usually concealed in the heart of the tree, it is obviously no easy matter to dislodge or destroy it; but this should always be attempted as soon as its presence is detected, which it will first be by its extruded excrement, and the saw-dust caused by its mordications. The remedy recommended by Latreille is a good deal approved of in France, and it may accordingly be mentioned, although we do not place much faith in its efficacy. It consists in surrounding the base of the tree, where the eggs are almost invariably deposited, with a thick coating of a mixture of clay and cow-dung, which becomes so hard, that the insects cannot penetrate it. It has been thought that blowing tobacco smoke into the holes, would not be without effect in dislodging the enemy; and in certain circumstances it may not be difficult to destroy them by thrusting a pointed wire into the openings. The large size of the moth renders it an object that cannot easily be overlooked, and it may readily be caught by means of a bag net, and incapacitated for further mischief.

Buff-tip Moth—Pygaera bucephala. Donovan's Brit. Ins. i. pl. 3. *Nat. Libr. Brit. Moths*, pl. xv. fig. 3.—The antennæ in this genus are rather long, appearing bipectinated in the male, each joint emitting a double tuft of ciliæ on each side; the apex, however, is simple, as is the whole antenna in the female. The palpi are short and two-jointed; and the thorax has a crest or strong ridge of hairs on the back. The hinder margin of the anterior wings is dentate. The only British species is a finely-coloured moth, the wings of which expand about two inches and a half. The upper pair are of a light brown colour, thickly powdered with silvery scales, each of them with a large rounded yellow spot on the tip, slightly clouded with ochre-yellow externally, and bounded on the inner side by two parallel rust-coloured lines, which are continued to the inner edge of the wing; before the middle there is likewise a double transverse rusty line, and a single blackish one near the base. It is the buff-coloured mark just decribed which has suggested the English name of this pretty moth. The under wings are entirely yellowish-white, with a dusky suffusion on the disk. The thorax is ochre-yellow, with two parallel dark rusty lines round the sides.

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* Journal of a Naturalist, p. 295.

The eggs are commonly laid on the underside of the leaves of the tree on which the caterpillars are destined to feed. These usually make their appearance in June or July, and are at first of a blackish colour. They are at all times gregarious, but in their earliest stages, when comparatively little food suffices them, a colony of them marshal themselves in a kind of regular order on the same leaf, and traverse it in a body, consuming the pulpy substance nearly in the same way as the larvæ of the willow-leaf beetle (*Phaedon Vitellinæ*), were formerly described as doing. When full grown, the caterpillar is nearly two inches long, yellow, with numerous longitudinal black stripes on each segment, interrupted at the incisures; the head and outside of the legs black; the body with thinly scattered hairs.

The elm, beech, lime, and willow, seem to be almost equally infested by this caterpillar, and several other trees, as well as certain kinds of shrubs, are occasionally visited by it. When it does occur, it is usually in great force; and as it is very voracious, the verdure soon disappears before it. It may be easily known when lofty trees are inhabited by it, both from the sudden discoloration of the foliage, and the ejectments of the caterpillar on the ground beneath. When full grown, and ready to undergo its metamorphosis, it becomes languid and heavy, and allows itself to drop to the earth, where it creeps about for some time till it find a proper place to burrow in and change its form. The pupa is dark-brown, as is the case with the generality of moths, and is not inclosed in a web.

The insect is very plentiful in many parts of England, and occasionally visits our less genial climate, as we are informed by Sir William Jardine, that the larvæ are sometimes very common on the chestnut in Dumfriesshire, and we know that it occurs elsewhere in Scotland.

Birds of various kinds, and, in particular, the cuckoo, devour this caterpillar greedily. By some fatality, comparatively few of them reach maturity; but still it is desirable that even that number should be diminished. Kollar tells us, they may be easily destroyed by picking them off when young; the facility of such an operation, on lofty trees, and in such places as Windsor Park or the New Forest, is not very obvious. It would seem a much easier task to destroy them when they descend to the ground, after they are full grown, and are moving about in search of a proper place for becoming transformed into pupæ; the latter also might be found by digging beneath the trees on which the caterpillars abounded. These measures, together with the capture of the moth itself, whenever practicable, would be more likely to keep their numbers within proper limits, than any attempt to handpick the caterpillars after they have appeared in swarms.

Figure-of-8, or Black-Thorn Moth—Episema cærulocephala. Harris' Aurelian, Pl. 30, *Fig. f, a—d. Donovan's Brit. Ins.* iii. pl. 100.—The following are the generic characters of Episema, and description of the species in question, as given by Mr Stephens in his valuable illustrations of British Insects. Antennæ rather long, not curved, bipectinated to the apex in the males, simple in the females; palpi long and very pilose, 2-jointed, basal joint large, the terminal one very long, slender, acute, and scaly; spiral tongue short; thorax slightly crested; abdomen rather stout, with a simple tuft at the apex; wings elongate, the anterior pair entire on the hinder margin.

The colour of E. cærulocephala is griseous; anterior wings ashy-grey, with an oblique black line at the base; then an undulated black streak, followed behind the middle by another, very much waved, and somewhat parallel with the hinder margin, bordered externally towards the costa with whitish; between these are two kidney-shaped confluent stigmata with whitish edges, and a double greyish-white centre;* on the hinder margin is a cinereous fascia, bounded externally by a narrow indented black line; on the anal angle is an abbreviated black streak; the cilia griseous spotted with brown; posterior wings whitish, with a black streak at the anal angle, the nervures and a central spot dusky; thorax anteriorly griseous, posteriorly cinereous; abdomen dusky griseous, with the apex brownish: female rather darker.

The caterpillar of this moth, when it reaches maturity, is nearly two inches long, of a yellowish-green colour, with three pale-yellow stripes, one on each side, and the third, which is broader, running along the back. There are numerous black tubercles scattered over the body, each of which has a hair in the centre. The head is small, and of a blue colour (whence the specific name), with two black spots on it. In the young caterpillar the colour is lighter, and gradually deepens with age, till it acquire nearly a bluish tint. At the time of pupation they leave their feeding-places, and construct a rough cocoon, covered externally with moss, chips of wood, withered fragments of leaves, &c. and remain in this for two or three weeks before their transformation takes place. The chrysalis is small and nearly cylindrical, of a dull reddish-brown, and covered with a slight bluish powder. It continues in the chrysalis state for about three months.

The female lays her eggs singly on the leaves. They are described as being semicircular, furrowed, and of a light-green colour. In some seasons the insect is very common in many parts of the country, and is one of those which lend their aid in defoliating and disfiguring our hawthorn hedges. In Britain it is found chiefly on the plant just mentioned, and the black thorn; but on the Continent it seems to have a preference for fruit-trees.

> "As the caterpillars," says Kollar, "particularly when they appear in great numbers, seriously injure the fruit-trees, they undoubtedly demand the attention of the gardener. There is no other effectual way of diminishing or destroying them, but by handpicking as soon as they appear. This can be best accomplished in rainy days, when they take refuge under the branches and on dry places of the stem. It is difficult for an unpractised eye to find the pupæ, as they are covered over, when on the stems of

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* It is from these marks that the insect is named the figure of 8-moth.

trees, with moss, or minute pieces of bark, in the hedges with chips, and on walls with mortar; yet with some degree of attention, their presence can be detected by their rather elevated oval form, and they may be destroyed by the application of the garden knife or a piece of wood. They are much relished by some birds on account of their fleshy rather smooth bodies, and several ichneumon flies and tree-bugs essentially contribute to thinning their numbers."

Lackey moth—Clisiocampa neustria. Donovan's Brit. Ins. iii. pl. 95. The antennæ in this genus are short and curved, moderately bipectinated in both sexes, the pectinations gradually decreasing in length to the apex, and shortest in the female; the palpi are minute, three-jointed, the terminal joint very minute and oval; head very small; thorax robust and pilose; abdomen slightly tufted in both sexes; wings acute, short in the male, long in the female.

The species now to be noticed has the antennæ, thorax, abdomen, and fore-wings of a rusty fox-colour, the latter with two yellowish streaks running obliquely across them; posterior wings ochrey-red, with a darker fringe. In the female the fore-wings are pale ochrey, with a broad oblique streak, margined with yellow, in the centre; hinder wings darker with a transverse dusky streak. The tint of the insect, and the form of the streak on the fore-wings, varies very much. The same thing may be said regarding its size.

This small and plain-looking moth is one of those most dreaded by arboriculturists of every description, for it appears almost every year in great abundance, and being a polyphagous feeder, attacks almost every kind of tree with equal voracity. It is, in fact, one of the most constant and troublesome of the insect pests with which gardeners and foresters have to contend; and it is therefore important that they should be well acquainted with its natural history as the best means of rendering effectual any preventive or remedial measures they may adopt respecting it.

The moth appears in the end of June, or in July and August, and immediately after finding a mate, the female begins to lay her eggs. They are laid with great regularity in rows, which are arranged in rings round the twigs of trees, placed close to each other, and firmly adhering in one mass. Their form well adapts them for such a disposition, as they are nearly in the shape of a funnel-shaped wine-glass, wider at top than at bottom, so that they unite together like the stones of an arch. They are covered with a strong cement, insoluble in water, in consequence of which they sustain no injury from the weather although exposed on the extremity of a branch to all the vicissitudes of the season. Each packet of eggs contains two or three hundred, or upwards. The caterpillars burst the shell in spring, in the months of April or May. They are social at first, and live together in a large nest closely spun over with silk, and usually placed at the forks of the twigs towards the extremities of the branches. Reaumur thus describes their proceedings at this stage of their growth. "They are social during their infancy, and spin in concert a sort of cloth which serves them as a tent, under which they have some leaves to feed on. When their provision is out, the family remove to another part of the tree where they can find more, and where they establish themselves afresh as before. This economy, which continues while the caterpillars are young, is sufficient to strip a tree entirely when there are two or three of these numerous families. During the night they return into the nest, but by day-time they parade upon its surface, withdrawing, however, immediately on the approach of rain. They walk like the *processionary* caterpillars, but not in so continuous a file nor in equal range. The procession is often interrupted in its march by caterpillars returning to the nest, and by others halting. Having gone a certain distance, the procession often stops, and the caterpillars crowd together. Some then return by the same road, others pursue their course, always at a slow pace, and without the least confusion. If any of those that go first be touched slightly with the finger, it is amusing to see them shake their heads several times, and go back quickly, without being stopped in their flight by any of their companions, who follow the first route with a tranquil step. If their way be divided, their inquietude and embarrassment are extreme. The cordons which they form have a beautiful effect, appearing at a distance like traces of gold, some in a right line, and others in curves of various inflexions. What renders this spectacle more agreeable is, that the cordon of gold is couched upon a silken riband of a bright and silvery white."*

These associations do not continue beyond the second or third moulting, when the caterpillars disperse and become solitary. They are usually full grown in the month of June, when they measure about an inch in length; are soft and thinly haired, marked with blue, red, and yellow stripes, and having a white line along the back; the head bluish grey, with two dark spots.

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* Griffith's Cuvier, vol. xv. Supplement, p. 655.

It is this gaudy livery which has procured for the insect the fanciful name of lackey, which is but little applicable to the perfect insect, as it affords a striking example of a remarkably plain moth proceeding from a gaily ornamented caterpillar. Before changing to a pupa, it spins a slight oval web, generally between two leaves, and this it lines with pellets of a yellow downy substance, and it is sprinkled over with a kind of dust. The chrysalis is of a dull leaden colour covered with fine powder, and its inmate continues to repose in it for three or four weeks.

Many methods have been practised to free the trees from these despoilers, all of them however necessarily entailing a considerable degree of trouble. On low fruit-trees (for it is on fruit-trees alone that it will probably be thought worth while to attempt this), the extremities of the branches may be examined for the bracelets of eggs, which, when found, should be removed from the twig with a knife, and effectually crushed. This research will be most successful after the leaves have fallen from the tree. A like scrutiny may be instituted for the cocoons in June and July, many of which will easily be found either enclosed between two leaves, in crevices of the bark, on wall tops, or other places affording slight concealment and shelter in the vicinity of the tree on which the caterpillars fed. But the principal onslaught should take place while the caterpillars are in their infancy, and colonies of them dwelling in a common tent. The size of the latter renders it conspicuous, and a whole hecatomb may be sacrificed at once by crushing the web together between two hard substances, or it may be swept into a pot with its contents, and these afterwards destroyed by immersion in hot water. The most common method adopted on the Continent to *uncaterpillar* (if such a word may be coined as a synonym of the French term *décheniller*, and the German one *abraupen*) trees so infested, is to cut off the twigs supporting the nest with a pair of strong scissors or caterpillar shears* (*wurmscheere*), which can be done with greater ease, and renders it unnecessary to ascend the tree. But this occasions the necessity of mutilating the tree to a certain extent, and, in the case of fruit-trees, removing many of the blossom buds; this objection, however, is not so important as it may seem, for such buds as are included within the tent are very likely to prove abortive. The destruction of the moth itself, when it appears on the wing, should never be overlooked.

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* The most convenient form for constructing shears adapted to this purpose will be afterwards described.

The oak, beech, elm, hazel, sloe, and various kinds of fruit-trees, are most liable to be attacked by the lackey moth: it has occasionally been known also to infest pines. It is most abundant in the south of England, and appears to become somewhat scarcer as we come northwards. According to Smith and Abbot, the same insect occurs in North America, where many of the fine oaks of that country suffer sadly from its ravages.

THE AGRICULTURIST'S NOTE-BOOK.—NO. XVIII.

Rhind's Vegetable Kingdom.[*]—Of the numerous and laudable attempts which have been recently made to popularise natural history, and present it in such a form as to be at once attractive and accessible to readers of every class, not a few, as might have been expected, have reference to the vegetable kingdom. The vast, not to say boundless, extent of the subject, the direct and paramount influence which plants exercise on the living inhabitants of our globe, their exquisite beauty, whether as individuals or as congregated masses forming the principal features in a landscape, their curious structure and functions, are all conspicuous attributes of this department of nature's productions, emphatically recommending them to careful and general study. "There is a universal language," says the author of the work quoted below, "in the waving woods—the green pastures—the odoriferous and variegated garden,—aye, and in every flower that scents the summer gale; they speak a poetry never yet imbodied in ordinary speech—which is intelligible to every mind, and finds an answering chord in every human heart. To the philosophical inquirer, what does not the vegetable kingdom unfold? Every seed is a miracle of creative power; every plant, from its lowest origin to its ultimate perfection, discovers in its structure and functions a wondrous and unerring arrangement, filling his mind with admiration and gratitude. But, apart from sentiment and philosophical inquiry, the products of the vegetable world are deeply important, as bearing upon the necessities and conveniences of mankind. Under all circumstances, and throughout the various phases of savage and civilized life, man derives a large portion of his subsistence from the fruits of the earth; the diseases to which he is liable are frequently warded off or alleviated by the medicinal qualities of the plants which surround him; he is clothed with vegetable coverings, and sheltered in a dwelling constructed from forest spoils; and, for the luxuries pertaining to advanced civilization, he is deeply indebted to vegetable products. Though primeval Eden exists no longer, the wide garden of nature still offers to man and the inferior animals things good for food, and much that conduces to their comfort and happiness."

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[*] A History of the Vegetable Kingdom, embracing the physiology, classification, and culture of plants, with their various uses to man and the lower animals, and their application in the arts, manufactures, and domestic economy. By William Rhind, member of the Royal College of Surgeons, &c. Blackie and Son, Glasgow, 1842.

Notwithstanding the innumerable ways in which vegetables administer to our necessities and enjoyments at the present time, it is impossible to prescribe limits to the further benefits which they may be reasonably expected yet to supply. To such a result we are entitled to look, in the first place, from the discovery of new plants; and, secondly, the detection of new properties in those with which we are already acquainted. Of the mighty host of plants now included in our botanical registers, how large is the proportion of those whose history and qualities are entirely unknown! A seed or root, it may be, is sent from a distant country, and under the fostering care of a skilful cultivator, is induced to grow and blossom; it then takes its place, with all the precision and formality of an object which has been thoroughly brought within the domain of human knowledge, in the established categories of the science. But how little acquaintance with its real properties does all this imply! It may contain a new chemical principle,—it may be capable of affording, in a more concentrated form than elsewhere exists, some of the most useful of vegetable products,—a new specific in medicine, or a valuable agent in the arts; yet all these are latent. It is true that the natural system in Botany, by which we are enabled, with some degree of certainty, to predicate certain things of any given plant, from what is known in regard to others nearly related to it, may assist our inquiries in such a case; but how imperfect and unsatisfactory often is the information derived from this source! The plant in question may be in some degree insulated, having no near relationship to any known species; and even if it be otherwise, it may possess properties to which its nearest allies afford no index. The *Solaneæ*, for example, are a poisonous family of plants, and yet one of the species—the potato—by a slight aberration from the normal structure of its kind, has been found capable of affording food to millions. The true sources of the further benefits which the plants already known are undoubtedly calculated to confer on mankind, are to be found in the greatly improved processes of chemical analysis, and more extensive experiments than have yet been undertaken on those properties of plants which do not fall directly within the province of chemistry.

The additions which may yet be expected to the number of known plants are very great. It would lead us too far from our present purpose to enumerate the regions with whose vegetable productions we are either entirely unacquainted or which are imperfectly known; but they are both numerous and extensive, and are to be found in both hemispheres. With some of them we will probably remain long unacquainted, in consequence of the physical obstacles which oppose themselves to examination being such as human ingenuity can scarcely overcome; discovery, in such cases, will be the result of some fortunate accident, or a change of circumstances which we cannot now foresee. Such may be said to be the case with Central Africa, in which even those great natural canals, which, to short-sighted mortals, might seem the pathways which Providence had opened up as avenues of communication for the purpose of bringing its inhabitants within the great family of Christian and civilized man, have been found, by sad and recent experience, to be as pregnant with disease and death as the most pestilential desert that was ever swept by a simoon. But fortunately there are many countries yet to be explored, where such formidable obstacles are not likely to be encountered, and from these we may expect a rich harvest. Even those which have been repeatedly traversed may yet contain much that has been overlooked. That this is the case is strikingly demonstrated by the fact, that even in this country, although of comparatively limited extent, and repeatedly explored in every possible direction, by the multitude of botanists that have sprung up since the subject has almost become what it (as well as some other departments of natural history) always should be, a branch of general education, a good many additions have lately been made to our native Flora, and these, too, not consisting of some obscure lichen or cryptogamous atomy, scarcely visible without a microscope, and which would almost tempt one to believe in the doctrine of spontaneous generation, but of conspicuously flowering (phænogamous) plants.* What vast accessions may we not therefore expect from other quarters, even though frequently visited, not to speak of those which, in this point of view, are as yet terræ incognitæ!

But these considerations, whatever may be their ultimate influence on the resources yet to be found in the vegetable kingdom, affect the subject, in the first instance, in its more scientific relations, rather than in the light in which it is regarded by the author of the volume now before us. His object is to give a popular view of vegetables, especially such as are most useful to man and animals, after a plan similar to that adopted in an enlarged and illustrated edition of Goldsmith's Animated Nature, issued by the same publisher. The work may therefore be regarded as a desirable continuation of Goldsmith, taking up a department on which he scarcely touched, although, at the same time, the two works are altogether independent of each other. The first part treats of the physiology of plants, and contains a sketch of the progress of botany, botanical classifications, and geographical distribution of plants, nature of soils, &c. Respecting the interesting subject of the geographical distribution of plants, the author affords a good summary view of the ascertained facts, and we may present a few extracts to convey a notion of the manner in which this portion of the work is executed. "Scarcely 1400 species of plants appear to have been known and described by the Greeks, Romans, and Arabians. At present more than 3000 species are enumerated as natives of our own island; and the researches of botanists in other parts of the world, have extended our knowledge of the vegetable kingdom to at least 50,000 species. Of this vast number comparatively few belong indiscriminately to all climates and situations; none, perhaps, except some mosses and other obscure plants, which appear to require for their existence only an abundance of shade and moisture. This limitation of particular plants to certain latitudes, is undoubtedly connected with certain peculiarities in their internal structure; though, for the most part, we are unable to discover in what those peculiarities consist. Independently, however, of the restriction thus imposed by the climate of every place on the nature of its vegetable productions, each division of the earth appears to have given birth to a set of plants distinct from those of other parts. Thus a large proportion of the trees and plants growing wild in the western hemisphere, are unlike those of the eastern hemisphere in the same latitude. The vegetable productions of the Cape of Good Hope are unlike those of the South of Europe, though the climate in these two situations is little dissimilar. The plants of the East Indian islands form another distinct class; those of China and Japan another; those of New Holland again another. The little island of St Helena contains a set of plants peculiar to itself, not one of which is to be found on the neighbouring western shore of the Continent of Africa. The plants originally belonging to one part of the world, when removed to another enjoying a similar climate, often appear to flourish as well as in their native soil. Thus, the potato, a native of South America, which was brought to England by Sir Walter Raleigh, in the reign of Queen Elizabeth, grows as well here as the turnip, the carrot, or the cabbage, which are natives of Great Britain. In like manner do the sugar-cane and the coffee-tree flourish in the West Indies, though not originally produced there, but transplanted, the sugar-cane from China, the coffee-tree from Arabia."—(p. 158.) "The line which limits the cultivation of corn, like that which limits the growth of the oak and other forest-trees, extends much farther north on the western side than on the eastern side of the Continent. In Norway, barley sometimes ripens, in favourable aspects, under the 70th parallel of latitude. In European Russia, the cultivation of corn scarcely succeeds beyond latitude 60°; and in Kamschatka, the eastern extremity of Asia, the limit descends as low as 51°, the latitude of London. On the eastern shore of the Continent of America, the growth of corn does not extend beyond latitude 52°. Wheat demands a warmer climate than barley or oats. This grain is not found to succeed so well in the west of Scotland, the summer's sun being insufficient to ripen it. Even in England, the western side of the island appears better adapted to the growth of grass than of corn; and, accordingly, it may be observed, in every part of the kingdom, that corn is carried from east to west, while cattle are driven from west to east. All our principal corn counties are situated on the eastern side of the island, from the Lothians, in Scotland, to Kent, the south-eastern county of England. This is to be attributed, in a great measure, to the humidity of the climate in those districts bordering on the shores of the Atlantic. The cultivation of corn does not succeed better in the torrid zone than in the polar region. Within the tropics, wheat, barley, and oats, are not cultivated, excepting in situations elevated considerably above the level of the sea."—(p. 161.)

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* These additions to the Flora Britannica will be found enumerated in the Catalogue of British Plants, recently published by the Botanical Society.

After tracing the progressive changes in the character of the vegetation from the extremest north, where the red snow (*Palmella nivalis*), a minute cryptogamous plant, is the only supposed representative of the vegetable kingdom, through regions where, in succession, the inhabitants derived their knowledge of wood from a dwarfish plant with stems no thicker than the finger,* the countries of the dwarf-birch and reindeer moss, of the pine, the apple, and ordinary produce of temperate climates, we at last reach the exuberant regions of tropical vegetation, the native countries of the bamboo, arborescent ferns, and the princely palms. Although the latter are the most characteristic of tropical plants, they are not exclusively confined to the vicinity of the Equator; to the traveller, southward, the dwarf palm (*Chamærops humilis*) first presents itself as a kind of *avant-courrier* of its more august associates; and even in the South of Europe and North of Africa, the eye is often greeted with

Groups of lovely date-trees, bending
Languidly their leaf-crowned heads,
Like youthful maids, when sleep descending,
Warns them to their silken beds.

" The species of palms hitherto discovered exceed 130 in number. Not only do they excel every other family of plants in beauty and stateliness, but in the luxuriance of their fructification. Amidst the solitudes of the South American forests, in places far remote from human habitation, Humboldt found the ground covered with the fruit of these trees in places to the depth of three inches. More than 12,000 flowers have been counted in a single sheath of the date palm."—(p. 170.)

When we hear of such extraordinary instances of fertility and rapidity of growth, such as the bamboo attaining in a few months the height of 60 feet, we are apt to form exaggerated notions of the temperature of equatorial regions; yet a few facts will show, that the mean annual temperature is by no means so different from that of other parts of the globe as we might suppose. There is, in fact, no reason to believe that it exceeds 82°, an elevation which the thermometer not unfrequently attains, though for a very short period at a time, in this country. The mean temperature of Cumana, on the northern coast of South America, in latitude 10° 27′, is 82°; that of Havannah, the capital of Cuba, in latitude 23° 10′, is 78°; that of Madras, in latitude 13° 5′, is 81°; that of Manilla, the principal of the Philippine islands, in latitude 15°, is 78°. "In fact the climate of most parts within the Tropics is more remarkable for equability than extreme heat. Twice in the year the sun is vertical to every place lying within the torrid zone; therefore, every place so situated should have two summers in twelve months, and of course, two winters. But, in fact, the difference of temperature at different seasons is so trifling in those regions as scarcely to attract attention; at Cumana, for instance, the mean temperature of the winter is 80¼°, that of the then hottest months only 83½°. The different seasons are marked by circumstances far more striking than this slight difference of temperature. From the time when the sun becomes vertical in its passage towards the Tropics, till it again become vertical in returning to the Equator (that is, during the time answering to summer in the temperate zone), the country, in most parts of the tropical regions, is deluged with almost continual rain, while the other part of the year is a season of fine weather."—p. 169.

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* Captain Ross's Narrative.

In arranging the subjects of which he has to give a detailed description, the author adopts the natural system of Jussieu, in so far as he has portioned out the vegetable kingdom into three great divisions, commencing with plants of the simplest structure, and ascending to those of a more complicated nature. To this, however, he does not closely adhere, but rather arranges the plants of each division as they furnish food, clothing, or other conveniences to man. The first division consists of the algæ, fungi, lichens, mosses, and ferns, in regard to each of which he furnishes many interesting particulars, some of them derived from sources scarcely accessible to the general reader. The second division consists of monocotyledonous plants, and commences with the *gramineæ*, under which head our agricultural readers will find a comprehensive description and history of the various kinds of the cereal grasses. Into these details, however, we cannot here enter, but must refer to the work itself, which we are convinced, no one can peruse without pleasure and instruction, and which is particularly valuable to those who have not studied Botany as a science, by presenting them, in an easily attainable form, with a variety and extent of information, which they could not otherwise obtain but from a variety of different works, many of them not easy to be procured.

We must not omit to mention, that the work is profusely illustrated, and the illustrations form one of its most useful and important features. A large proportion of the plants are represented by wood engravings, in general well executed, although, in some instances (as at pages 179 and 180), they are on too small a scale; an evil, however, which the plan followed rendered it difficult to avoid. The geographical distribution, and general aspect of vegetation, both in the Tropics and in temperate countries, form the subjects of a considerable number of engravings on steel. Of all the illustrations of this nature that have come under our observation, we have seen nothing equal to these in merit, whether we regard the artistical skill they display, or the beauty of the engraving. The representation within a small space of objects, in some degree heterogeneous, and which, perhaps, never occur in juxtaposition in their natural state, requires great skill to avoid glaring incongruities, and form into any thing like a consistent and harmonious picture. The attempt to do so in the present instance is the most successful we have seen. Vegetables of most diversified forms, and from widely remote localities, are grouped together with great taste, and so blended with the general landscape as to produce no harsh and unnatural contrasts. Animals appropriate to the scene, are judiciously introduced, and drawn with a degree of accuracy which indicates a familiarity with such subjects. In some instances the artist's skill has been in some degree frustrated by the small size of the plates. Thus in plate ix., which is a beautiful woodland scene, representing our native timber-trees, while the oak in the foreground is given (in certain of its parts) with an effect worthy of Strutt, the characteristic leafing of the other trees is almost entirely lost. These beautiful plates are all from drawings by Mr J. Stewart, an artist whose genius we have often had occasion to admire in other instances besides the present.

*Dick's Manual of Veterinary Science.**—This little volume is a reprint of the article under that head in the seventh edition of the Encyclopædia Britannica. It is written and compiled with great care, affording a synoptical view of the present state of our knowledge on this subject, calculated to be of considerable service to all those interested in the rearing and preservation of our domestic animals. Owing to the object for which the treatise was originally designed, it has necessarily been compressed into as small a space as was consistent with utility; but this conciseness is not without compensating advantages, as it renders the classification of diseases, and the systematic view of the whole subject, more simple and intelligible, while it is not carried to such an extent as to preclude the enumeration of the best remedies, and many practical hints derived from experience. When the subjects cannot be discussed at length, reference is made to the best authorities, so that in addition to the useful information it affords in itself, the manual becomes a kind of index to the bibliography of the veterinary art.

It is certainly highly desirable that information respecting the disorders of domesticated animals, and the best means of treating them, should be disseminated among our agricultural population, for it is a subject with which they are much less acquainted than it is their obvious interest to be. In many parts of the country the remedies applied are such as have been in use from time immemorial, many of them administered indiscriminately,—many of them inefficient from their very nature—and not a few actually absurd. In certain parts of the South of Scotland, where better things might have been expected, almost the only remedy applied to the internal diseases of cattle, is a bolus made of an umbelliferous plant, patches of which are found growing, for the purpose, about the older steadings, as regularly as the chamomile bed in the garden, for the behoof of the human subject. Some of the disorders to which the animals of a farm are liable, are of as speedy operation as in man, which renders it the more necessary that some one on the spot should be competent to give relief, for in many parts of the country the *scientific* men who rejoice in the appellation of *horse* and *cattle doctors* are but thinly scattered; and it may be added, neither their character nor attainments are, in general, such as to induce the wish that it were otherwise. Unacquainted with the general structure and physiology of the animals they are called to operate upon,—ignorant of the great principles of the healing art,—incapable of forming a proper diagnosis of the symptoms of disease, or of estimating the effect of the medicines they administer, the result of their treatment can never be relied on; and it is well if the hapless patient is not made worse, instead of being benefited by their nostrums. Their practice, in fact, for the most part, involves some of the worst elements of quackery. Originally grooms, jockeys, or horse-dealers, and having, in one or other of these capacities, gained some knowledge of what is called horse-flesh, and of the traditionary and current modes of treating the diseases of animals, they seem as confident as if they had obtained the diploma of all the colleges; and, still retaining some relics of their former avocations in the peculiar cut of their habiliments and picturesque expressiveness of speech, begin to practise *on* some devoted district. They in time become well-known characters in the territory which forms the scene of their operations, and particularly well-known at every village ale-house to be met with on their route. When consulted in a case, their almost invariable practice, in the first instance, is to bleed; the operation is easily performed, costs them nothing, and forms a pretext for a fee, so that the farmer's horse and his purse are made to bleed in unison. And such, in too many instances, are the individuals to whom alone recourse could be had for relieving the sufferings of our most useful animals,—sufferings, too, contracted, in far the greater number of cases, in our service; for, if left to themselves, how few are the maladies to which they are liable! For the purpose of correcting an evil for which self-interest, not to speak of humanity, might be supposed to have long since sought a remedy, nothing can be more useful than the circulation of such works as the Manual in question, for by presenting, in a small compass, a compendious view of the "*principles on which alone the diseases of domestic animals can be properly treated*, it affords the best antidote to the quackery by which many valuable animals are sacrificed, and serious expense and vexation occasioned."

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* Manual of Veterinary Science. By William Dick, Professor of Veterinary Surgery to the Highland and Agricultural Society of Scotland. A. and C. Black, Edin. 1841.

By the exertions of Professor Dick and other modern professors of the science, a new school of veterinary practice has been established on a safe and philosophical basis; and when the pupils of that school, which are fortunately numerous, become scattered through the country, a most beneficial change will be produced. Indeed, much good has already been effected; but it is not to be expected that men of education and professional intelligence will be ready to visit remote parts of the country, when the prospect of being remunerated for their skill is so slight; and there, accordingly, the old abuses must for a while prevail. It is not perhaps reasonable to expect that the healing art, as applied to animals, should in any case keep pace with the same art, as it refers to the human subject; but there is, undoubtedly, a greater difference between their respective states of advancement, than is at all creditable to the professors of the former. In many cases the diseases of animals are closely analogous to those of man, and in not a few they may be said to be absolutely identical; the most valuable hints, therefore, ought to be obtained from the study of human pathology, and these do not seem to have been made available for the improvement of the veterinary art, nearly to the extent of which they are susceptible. An excellent preliminary to obtaining the diploma of a veterinary school, would be to hold that of the College of Surgeons, and if this is more than can be expected from all who study the subject, it might at least be required of those who undertake to instruct others.

The views given throughout this little volume will, we think, be found sober, practical, and judicious, expressed in accurate and appropriate language; the only exception to the character which the former epithets imply, will perhaps appear in the author's notions of rabies or canine madness. "These," he says, "are the result of considerable observation, and leading, as we conceive, to most important and beneficial results, we will neither conceal nor compromise our decided convictions. We hold, then, that rabies is essentially an inflammatory affection, attacking peculiarly the mucous membrane of the nose, and extending thence through the cribriform plate of the ethmoid bones, to the interior part of the brain, so giving rise to derangement of the nervous system as a necessary consequence: this train of symptoms, we consider, constitutes mainly, if not wholly, the essence of our occasional epidemic, not unlike some forms of influenza or epizootie; and the bite of a rabid animal is not, to another so bitten, the exciting cause of the disease, but merely an accidental concomitant in the prevailing disorder; and the disease, hydrophobia, produced in man, is not the result of any poison introduced into his system, but merely the melancholy, and often fatal result of panic fear, and of the disordered state of the imagination. Those who are acquainted with the effects of sympathy, and imitation, and panic, in the production of nervous disorders, will readily apprehend our meaning; and if our view be correct, the immense importance of disabusing the public mind on the subject is apparent. This is a task which we hope one day to accomplish."—p. 95. The author premises these remarks with the observation, that his views on this subject are not a little peculiar, and in this, it is presumed, few will dissent from him. The ground he takes up appears to us to be wholly untenable, and completely at variance with the actual phenomena. It is inconceivable how panic fear alone could produce the definite, uniform, and very peculiar symptoms witnessed in cases of hydrophobia; and if it is the dread of some special disease that gives to these symptoms their singular character and intensity, how could that dread be at first produced before it was known that any particular malady would follow? But it is unnecessary to enter upon the subject in this place, further than to say, that if Professor Dick's theory of canine madness should find any supporters, it will be well for them not to act upon his views, lest they should discover, to their direful experience, that there is something more in the matter than some inflammation and some panic fear.

Milium effusum. By Mr ARCHIBALD GORRIE.—A short note, descriptive of this sylvatic plant, with its uses, as affording food for pheasants in woods, appeared in the 48th number of this Journal, at page 642. My name being appended to that note, has produced several inquiries as to whether farther experience enables me still to entertain the same favourable opinion therein expressed, as to the culture and uses of this plant; and I am glad to be able to say, that as a wood plant, well calculated to afford excellent and desirable food for pheasants, as also, where that is necessary, a wholesome and full bite for young cattle in the autumn months, it appears to me highly deserving of attention. The numerous inquiries as to its nature shew that the subject excites considerable interest; nor can this be wondered at. The pheasant has now become naturalised in all our woods; and besides its occasional visits to corn-fields, with which the farmer could dispense, some feeding is necessary to bring over the winter that part of the stock left for breeding. Were woods sufficiently stocked with the *Milium effusum* or Pheasant Grass, this beautiful bird would find its natural food in its natural locality, and complaints by farmers on its depredations (which cannot but be disagreeable to any landlord) would cease; for let any gamekeeper try, and he will find that pheasants, or even domestic fowls, will give the preference to this small seed over any field grain.

I believe that seeds can now be obtained of this plant from seedsmen; and where *early effect* is an object, in place of sowing the seeds broadcast in such woods as are already covered with a dense herbage, a more economical method, and more likely to insure early success, might be, to sow a few pounds of seed in a garden or inclosed spot, where the seed-bed was tolerably dry, either in winter or *very early* in spring; by June the plants would be from four to six inches long in foliage, and ready to transplant into patches previously dug or trenched throughout the woods, in such open places as the proprietors, the forester, and the gamekeeper, might think most fitting: the grass easily succeeds by transplanting. If the weather is dry, the roots, on taking up, may be immersed in water, and a little dry earth thrown over them, and of course kept as little time out of the ground as possible. They may be planted at six inches apart, and a boy or girl will easily plant one hundred each hour; the patches may be of any size, from one to twenty square yards, and after the plants are put in, I know of nothing so likely to stimulate to vigorous vegetation as to sow over the patch a sprinkling of nitrate of soda, at the rate of about 1 cwt. per imperial acre. The seeds of this perennial will be ripe the following June.

As every proprietor has either a gardener or forester who is familiar with the process of transplanting, I need not be more particular on that point. In sowing, the seeds require to be but very slightly covered; but the earlier in the season they are sown the better, as they lie a considerable time in the ground. I had sown some broadcast, as recommended in my note, but found that the pheasants devoured the greater part of the seeds, which will be effectually prevented by the process now recommended.

*Loudon's Arboretum et Fruticetum Britannicum, abridged.**—It is with much pleasure that we announce this judicious abridgment, by Mr Loudon, of his large work which has done him so much credit, and which has done more towards promoting the science and practice of arboriculture than all its predecessors, and which will long continue to form an excellent work of reference to the landlord and those who take charge of his estate.

The high price of the large work, indeed, placed it beyond the reach of many who could appreciate its merits, nor do we think that its advantages are yet sufficiently known to a class whose pleasure and interest it is so well calculated to promote. The abridgment now offered to the public contains much that is valuable to the practical man as well as to the man of science; and the low price at which it is furnished places it within the command of all who feel interested in the subjects whereon it treats, and gives the gardener, the forester, or the land-steward who possesses it, a decided advantage over those who may be less fortunate.

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* Arboretum et Fruticetum Britannicum, abridged; or, the Hardy Trees and Shrubs of Britain, native and foreign, scientifically and popularly described, with their propagation, culture, and uses in the arts, and with Figures of nearly all the Species, abridged from the large eight volume edition, and adapted for the use of Nurserymen, Gardeners, and Foresters. By J. C. Loudon, F.L.S., &c. &c. London, printed for the Author. 8vo.

The woodcuts illustrative of the letter-press part are uncommonly numerous, compared with the low price of the work, and appear to be well executed—so well, that it is scarcely possible even for the uninitiated not to know the species or variety so illustrated. We subjoin the following extract, to shew the manner in which the properties and uses of trees are described.

> "The wood of the lime-tree is of a pale yellow or white, close-grained, soft, light, and smooth, and not attacked by insects. It weighs per cubic foot, when green, 55 lb., half dry 45 lb., and dry 37 lb.; and it loses a third part of its weight and a fourth part of its bulk by drying. It is used by piano-forte makers for sounding-boards, and by cabinet-makers for a variety of purposes. It is carved into toys, and turned into domestic utensils of various kinds, and into small boxes for the apothecaries. The most elegant use to which it is applied is for ornamental carving, for which it is superior to every other wood. This wood is said to make excellent charcoal for gunpowder, even better than alder, and nearly as good as hazel. Baskets and cradles were formerly made from the twigs; and shoemakers and glovers are said to prefer planks of lime-tree for cutting the finer kinds of leather upon. The leaves of the lime-tree, in common with those of the elm and the poplar, were used, both in a dried and in a green state, for feeding cattle by the Romans, and they are still collected for the same purpose in Sweden, Norway, Carniola, and Switzerland. One of the most important uses of the lime tree in the north of Europe is that of supplying material for ropes and bast mats, the latter of which enter extensively into European commerce. The Russian peasants weave the bark of the young shoots for the upper parts of their shoes—the outer bark serves for the soles; and they also make of it, tied together with strips of the inner bark, baskets and boxes for domestic purposes. The outer bark of old trees supplies them with tiles for covering the cottages. Ropes are still made from the bark of the tree in Cornwall, and in some parts of Devonshire," &c.

Having received much valuable information from the larger work, we can with confidence recommend this excellent abridgment to all who feel interested in arboriculture.

A. G.

*Johnston's Elements of Agricultural Chemistry.** —This little work we can earnestly recommend to all who have a wish to ground themselves in the interesting and important science of agricultural chemistry. Professor Johnston is far too well known as the author of "Lectures on Agricultural Chemistry," to require any fresh introduction to the public, so that in his present work his avowed purpose is merely to give a familiar outline of the science, in the most interesting form, in order, if possible, to draw the attention of farmers and others to the subject, who, it is to be regretted, have hitherto remained for the most part rather indifferent to many endeavours to excite their interest in it.

In the first part our author enters into the general principles upon which the science is founded, such as the distinction between organic and inorganic substances—the ash of plants—properties of carbon, oxygen, hydrogen, and nitrogen, &c., all of which are treated in a popular manner, and there appears to be a constant endeavour on the author's part to render his statements as simple as possible; in doing so, we think he has in one or two points spoken rather too loosely, nay, so much so, that we fear he has run a great risk of misinterpretation, particularly by those who are not already acquainted with chemistry: we refer more especially to the account of chemical transformations as they occur in plants.

Our author then proceeds to the more practical portion of the work; and with regard to this we unhesitatingly remark, that in our opinion nothing hitherto published has at all equalled it, both as regards true science and sound common sense.

We were already acquainted with his views, as far as they had been developed in his published lectures, and had admired them greatly; but we think that a still higher meed of praise is due to his observations on many points which occur in treating of subjects not yet arrived at in his Lectures, and we are looking anxiously forward to their publication, in order to hear all he has to say upon the points in question. We were much pleased with the geological chapter. Our author succeeds in distinctly proving the great advantage derivable from the study of geology, in pointing out the *general* constitution of the soil in any particular neighbourhood; of course all his observations upon this head must be considered as applying with much greater force to soil in its *natural condition* than to soil long under *cultivation*, as our author himself proves a little further on, that cultivation in the process of time alters most materially the constitution and chemical composition of the soil.

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* Elements of Agricultural Chemistry and Geology. By J. F. W. Johnston, M.A., &c., &c., Durham.

We also quite agree with his remarks on subsoil-ploughing; and we would particularly direct attention to the following general observations, which we have frequently seen verified in attempting to put in practice any new suggestions:—Let the practical farmer go cautiously to work, "and *above all*, let him make his trial *in the way and with the precautions* recommended by the author of the method, before he pronounce his condemnation;—strict attention to this simple and most fair precaution would have the effect of preventing fully one-half of the failures which experimental farmers are daily experiencing, and by which, more than anything else, they are discouraged from proceeding with their inquiries."

Our author next takes up the all-important subject of manure, and treats it with his usual clearness and good judgment, profiting by all the newly-discovered facts which are well authenticated, and, at the same time, judiciously keeping clear of the many high-flowing theories which have lately been imported from the Continent, and which have been so eagerly devoured by many persons in this country. After giving a general description of each class of manures, and the mode in which they act in promoting vegetation, in which he lays proper stress both upon their organic and inorganic constituents, instead of, as many have done, laying all the value upon the one class to the total exclusion of the other; our author proceeds to grapple with the puzzling question—How does digestion improve vegetable matter as manure? Under this head he has stated, what has for three years past been our decided opinion; so that while we cannot agree with the footnote, page 174, in yielding the palm of discovery to him, still we feel quite convinced that he has explained this much vexed question in the only rational way. We have employed precisely the same train of argument to prove various other disputed points concerning animal and vegetable nutrition, but our limited space will not admit of our even hinting at them at present.

Dispersed throughout the work, but more especially towards the close, are several valuable and interesting tables, which, on account of the practical manner in which they illustrate the various subjects, we would particularly recommend to the perusal of the intelligent farmer.

In conclusion we may again repeat, that we think the author has fully accomplished what he proposed in the little work before us, and we again strongly recommend it to the careful *study*, not the mere perusal, of all those who desire an insight into the most interesting science of agricultural chemistry.

The Supply of Manures.—By Mr JAMES HALKETT, Perth, Manager of the Perthshire Agricultural Company. — The landed proprietors and farmers of this county being annoyed by the scarcity, and sometimes altogether disappointed of obtaining bone manure in proper season for their turnips, and the great price which they were sometimes obliged to pay for it, came to the resolution, two years ago, of forming an association, whose object should be to keep at all times a supply of that article, and of other artificial manures that might from time to time be brought into use, and by the regular supply of which, the price would be kept steady, and at such a figure, as would repay the outlay, with a fair profit to the shareholders. Acting on these views, the company procured premises, and erected excellent machinery, with a sufficient supply of bones to meet the demands of the district. Although it was late in last season before the machinery was completed, the company was enabled to supply every one requiring the manure; and having a large stock of bones this season, they are enabled to supply any quantity at any time. Last year rape-dust was used in considerable quantity, and nitrate of soda in small parcels for trial; and this season guano has been added to the store.

Being the manager for this company, and receiving information from all the parties who use our manures of their effects upon different soils, and in different quantities, and in several ways, I am enabled to give a short statement of the effects of rape-dust and nitrate of soda, which are recent manures in this neighbourhood; and as to guano, it will be some time before any thing can be said of its effects.

1. *Rape-Dust.*—It is only a few years since this very valuable manure came into use in this quarter. Six or seven years ago, a cargo was imported and offered for sale at L.4, 10s. per ton, but no purchasers were found, and it had to be shipped to Leith at a loss of 10s. per ton. Since then, it has gradually come into use, and last season a great quantity was purchased and used in this neighbourhood.

The quantity used per acre varies much, according to the nature and state of the land.

For Wheat.—It is generally used after potatoes, at the rate of about 10 cwt. per acre. Last season the wheat was tolerably good, and the grass also looks healthy after it.

For Barley.—It is put on to the amount of 10 cwt. per acre on clay soils, or heavy loams; but on light land, a ton is generally made to go over three Scotch acres. It had the effect last season of raising more straw, and in many cases the crop fell over, and did not fill well, for which reason it has been used in less quantity per acre this season.

For Oats.—The same quantity as in the case of barley, when it is often put on after turnips that have been drawn, and in most cases the young grass does well afterwards.

For Potatoes.—From a ton to a ton and a quarter is used, a small quantity being put into the drill, and the potato set placed upon it. Some farmers put earth between the set and rape-dust. It is found to do well in heavy land, but in light land not so well. There is a greater breadth of it used for potatoes this year than last.

For Turnips.—Some prefer it to bone-dust, but always on heavy soil. Sometimes the land is drilled and harrowed down, and the rape put into the drills with the turnip-machine. Others sow the rape broad-cast over the rolled land, and then drill and sow, care always being taken to put a little earth between the seed and the rape, for if allowed to come in contact, the destruction of the seed is almost inevitable Numbers last season lost their crop from ignorance of this, having used it in the same manner as bone-dust, by putting rape and seed together, but were saved the trouble of pulling a crop.

For Tares.—It is excellent; I have seen them growing in several places, and never better. Eight cwt. per acre was the quantity put on; and although I have not known it used for pease and beans, I have no doubt it would do better with them than with almost any other crop.

2. *Nitrate of Soda.—For Wheat*—From one to one and a-half cwt. per acre is sown upon the crop about the latter end of March or beginning of April. Its effect appears in a very short time; should the weather prove favourable, in a fortnight or three weeks the wheat gets darker in colour and stronger in leaf, and I have no doubt turns out a greater crop; but the agriculturists here are at little trouble to ascertain accurately the additional quantity. The difference of crop between the trial and the rest of the field is only ascertained by the eye while growing.

For Grass.—It is used in about the same quantity and time as on wheat, and the results are nearly the same; and if the field is pastured, the cattle generally find out the part on which the nitrate was put, and eat it down in preference to the other parts of the field. I have known it used in aftermath, but had very little effect.

On Barley and Oats.—I believe it has been used, though I am not aware of its effects, further than that it was sown along with the crop, and was stated to have done no good; whereas, in my opinion, if the crop had been allowed to come well above the ground before it was applied, its effect could have been better appreciated.

3. *Cocoa-Cakes.*—A small quantity of cocoa-cakes, or the refuse

of the cocoa-nut, after the oil has been expressed, was sent us on sale. It is lower in price than rape-cake. Cows and pigs eat it, but of its manuring or feeding properties I have had little opportunity of judging.

On a field of heavy land, immediately beside our bone-mill, belonging to one of the partners of the company, a few drills of turnips were tried with our different manures, a drill to each, and the rest of the field was manured with scutch from London, and good stable-yard dung. One ton of rape-cake per acre was taken as a guide for the value of the others, viz. nitrate of soda, bone-dust, cocoa-dust, and linseed-dust. The whole field bore a good crop, although it was not so largely rooted as usual. These fine drills, and several beside them, were a few days later in sowing than the rest of the field. The estimate I took of the crop was only by the eye, not having an opportunity of weighing the loads ; but I thought the crops from the rape and bone-dust were about equally good, that from the nitrate of soda had been sown too deep, but what of it had been of proper depth, was stronger than either, and those from the linseed and cocoa dusts were both inferior.

There would be a much greater quantity of rape-cake and nitrate of soda used in this quarter were it not for their high price ; many farmers have stated to me that if we could sell rape at about L.5, 10s., they would take double the quantity ; and in my opinion if the nitrate of soda do not come down to less than half its present value, it will never be extensively used. All that has hitherto been so is only for trials ; but could it be sold at a moderate price, it would become an article of regular demand.

MISCELLANEOUS NOTICES.

I. *Indiscriminate Charity.*—"Charity covereth a multitude of sins."—"He who giveth to the poor lendeth to the Lord."—"Though I give all my goods to feed the poor, yet if I have not charity it profiteth me nothing."—Charity, like many another term, now expresses a different meaning from that which was attached to it in the olden time: Love, or Benevolence, is the real signification; if it were not, the last of the above quotations would be a contradiction. Clearly as this has been made manifest, however, thousands of human beings have continued, and still continue, to believe that almsgiving is the only interpretation of charity; and in this very limited sense do they practise the heavenly virtue. How cheerfully does the wavering worldly man lavish that portion of his wealth to which he looks for absolution from his errors! How many sordid spirits give to the poor, that it may be repaid by the Lord! Oh for the eloquent pen of a Chalmers, to express in appropriate terms our detestation of the degrading motive, the selfish feelings, which dictate such charity! With rare exceptions, the rich are not charitable. They give money, they display their names in subscriptions, they "get up" balls, concerts, fancy fairs, but this is not charity; they part with that which causes them no trouble, no inconvenience to bestow; they give that which "is theirs, 'twas his, and will soon be another's," but they give no more. It is the poor who are charitable; they freely bestow their most valuable gifts, sympathy, assistance, and time, hoping for no such selfish and sordid reward (for none such is promised to them) as that, the desire of which actuates too many an ostentatious monied man. We have often looked with admiration and reverence, and, let us add, with deep humility and regret, at our own inferiority to the oft-times contemned poor, when we have witnessed the promptitude, kindness, and unwearied assiduity with which our indigent neighbours render up their best possessions to their congeners when in affliction! Men who have toiled hard all day,—"sweated in the eye of Phœbus,"—and to whom a night's rest is a luxury,—devote those hours to watch by the bed of a suffering neighbour, whom an accident may have snatched from his daily work. Women, "whose work is never done," having churlish husbands to please, a numerous offspring to tend, and withal a vocation to which they must trust for subsistence, no sooner hear of a poor female in her hour of trial, or a child seized with illness, than their immediate, their cordial, and most efficient services are freely accorded to the distressed; their charity seeks no recompense,—no vain-glory accompanies such deeds—no chroniclers vaunt, no newspapers record *their* acts of charity! But to our subject,—"Indiscriminate Charity."—Charity, in our restricted sense of the word, is a misnomer when applied to the relief of the beggar. That beautiful line of Shakspeare,

"With a hand open as day to melting charity," has done much mischief; it has increased beggars, and misjudging almsgiving. It is well known, that the trade of begging, in all its branches, is one of the most lucrative that is followed; and as it is prosecuted in hypocrisy, deceit, lying, swindling, and idleness, while the best feelings of humanity,—our sympathy and kindness,—are called causelessly into activity, to the actual committing of a moral wrong,—the system of indiscriminate charity ought to be abandoned, and no feelings of benevolence indulged in for the benefit of our poor brethren, excepting in cases of known and undoubted necessity. Where our money, time, and pecuniary assistance are required, it is our duty to give them freely, when our charity is solicited; and if we are in doubt as to the truth of the applicant and his story, we but encourage idleness and vice by gratifying our misplaced and selfish benevolence. Doubtless many of our readers have been made the dupes of designing impostors; our own personal knowledge of the following facts will not, therefore, meet with discredit, particularly as we give our assurance that they are absolute truths. Our motive in making them public, is, that we may give our humble aid to check crime, and awaken a worthier, a more active spirit of benevolence in those who now give alms (to beggars) "for their much asking."

With regular beggars, the sum of five shillings a-day is a low average of gain; this we know to be a fact. And when we reflect that thousands of our industrious population, who toil ten hours in the twenty-four, and cannot procure more than one shilling a-day, the moral wrong which we commit in fostering vice and idleness, instead of devoting our time and money to assist virtue and industry, ought to cause us regret and shame! We once resided by the high-road from Portsmouth to Bristol, and were much annoyed with beggars; at that time, we had not "bought our experience," and were accustomed to relieve all wayfarers. Our "organ of individuality" is very active, and we rarely forget a face on which our eyes have rested. One of the first lessons we learned in our present pursuit was taught by a young man asking charity at the door, in a foreign head-dress, to whom we had given food and money a few weeks before, when he was without a hat, in flaxen ringlets, and his dress a sailor's garb, almost as melodramatic looking as T. P. Cooke could desire to wear.

We took compassion, one drenching November evening, while residing in London, on a miserable object who came to the front door with matches, the very gas-lights opposite were reflected through her one flimsy petticoat. Her tale was piteous: she had a paralytic husband at home, and no other method of procuring food, board, lodging, &c., than by the sale of matches. No day passed for some weeks afterwards that she had not food, clothing, money, &c. At length, she came with floods of tears, to say her husband was dead, and to request money to bury him. We instead gave tea and sugar, inquired the lodging, and told her she should hear from us the next day. We slept little that night, the sorrowful state of the poor woman, sitting solitary through the long hours of a winter's night, and a dead husband occupying the only bed in their only room, was a haunting thought! Early on the following morning, we sent our man to ascertain how the wretched mourner fared. He quickly returned; and we were not a little displeased to see a suppressed, scarcely repressible laugh upon his face. "I beg your pardon," said he, "but when I went into the room, the dead man sat by the fire gnawing the blade-bone of a shoulder of mutton, and he said that he knew his wife had offended you, for every thing that was given her she sold for gin."

We knew a gentleman who had a great anxiety to see the weekly meeting of London street-beggars, at their social repast. Much secrecy was required and observed, for obvious reasons. He did, however, discover their public house; and by bribing the landlord highly, obtained his wish, under these restrictions, that he should not mention the name of the house, and that he should hide himself from the observation of the beggars. The meeting, a supper, was held in an assembly room, in which was a raised orchestra, over the rails of this the landlord hung his great-coat, behind which our friend ensconced himself. "Covers were laid" for eighty, and soon the motley group were seated,—the "King of the Beggars" in the chair. Legs were unscrewed, false arms laid aside, and real ones drawn from their hiding-place; blind eyes saw, mirth and jollity prevailed; young ducks, green pease, fish, flesh, pastry, beer, wine, and spirits disappeared; and songs and laughter resounded through the room.

We knew a lady who had a favourite lady's maid, to whom she was attached, in consequence of her long residence with her, and the propriety and respectability of the young woman's conduct. One day, she told her mistress that she must leave her, as she was "going to change her situation." "Indeed, Mary! and who is to be your intended husband?" "Oh! he is a young man very well to do in the world, Ma'am, and very steady he is." "I hope so; but I am anxious for your welldoing, and should like to hear who he is, and know his occupation, that I may judge if you are going to make an imprudent marriage," persisted the lady. "Yes, indeed, Ma'am, his business is a *very* good one, and seldom brings him in less than six shillings a-day." "I am glad to hear it; but what *is* his business?" urged her mistress. "Why, Ma'am,—he—is—an asker." "A what?" exclaimed Mrs S. "Perhaps, Ma'am," said the girl unwillingly, "you would call him a beggar!" The young woman married this man; and the lady called a few months afterwards to see her old servant, in whose welfare she was really interested. She found her in a pretty, neat, comfortable house, in a newly erected row of buildings, which was well furnished; and she looking the picture of contentment. Her husband "*farmed a walk*" of three stated streets; and rarely, as she had mentioned, returned home at night, from his degrading and swindling occupation of obtaining money under false pretences, with less than six shillings!

Some time after having heard of this *fact* (for such it really is), a lady with whom we were in company commenced an anecdote,—the subject of conversation had been that of impostors,—and its features so nearly resembled those of the above, that we expected we were going to hear our friend's tale with another lady's name to it. The denouement, however, was different, for the new heroine had not married an "*asker*," but a man who possessed a warehouse of beggars' clothes. It was at the back of his respectable looking dwelling, and in this depot, were arranged and ticketed great numbers of disguises, suits of clothes, legs wooden and stuffed, and, in short, all kinds of masquerading devices, which were, every morning, let out on hire to numerous beggars, who daily came to choose and vary their modes of nefarious attire; and by this species of pawnbroking, or letting out on hire these filthy rags, the man obtained a very good income.

A poor woman in our own immediate neighbourhood was, one day lately, terrified by two sturdy beggars, who, finding her alone and timid, absolutely demanded relief; she had nothing to give them but an old waistcoat and trousers of her husband, which she was going to mend for him; the men appeared destitute. On the return of her husband from work, she told him how much she had been alarmed, and what she had given. "Then it *was* my waistcoat and corduroys, which Jem Sykes, at the Red Lion, took of them two chaps, as was getting drunk there when I came by!" exclaimed he; "they said they had no more money, and so he (Sykes) must have them clothes as they didn't want. Well, if I didn't think they looked like my clothes; but yet you know, I'd no thought they could be, Sally! You'll know better another time, I hope!" We had this from the woman herself.

One pouring drenching day, a woman in a cloak came to the door, and to our consternation took from beneath its folds a *totally naked baby*, of about three or four months old! After our first feeling, nothing but indignation remained, and we sent her away immediately, for the woman's own attire was too good and complete for that total destitution of the infant to be the result of want. As soon as she was gone, a servant whom we had not long engaged from a neighbouring town said, "I know that woman well; she always carries a baby about in that way to excite compassion, and she has had cart-loads of clothes given her for the poor little thing."*

We could relate many more anecdotes of fraudulent practices which we have *known* to have been resorted to by those whose trade it is to impose upon the credulity and benevolence of the community, but our limits warn us to close our subject. And we do so, with a hope, that having stated these facts (which *all* prove the error of indulging feelings of lazy benevolence), we have established our right to protest against the practice of indiscriminate charity.

II. *Rooks, Grubs, and Slugs.*—My chief object is to shew, from a consideration of the natural habits of grubs and slugs, by what means the farmer may best prevent or diminish the mischief done by them.

It is of great importance, in all cases, to *know accurately* the enemy we are called to contend with. The farmer spares no labour to extirpate the *weeds* from his soil; but he, in many cases, knows not *what* to do in order to avoid the depredations of grubs, slugs, wireworms, flies, beetles, caterpillars, mildew, field-mice, &c.; and, while he sits bemoaning his fate, a *Druid* accosts him, and among other *precious* advices bids him invite the rooks to his ground, protect their *sacred* nests, and leave the vermin to *their* care. Any advice which will relieve us from the necessity of exertion is much more readily listened to than one which demands our activity. But here the subject is really pressed by difficulties. Farmers have so many demands on their attention that few of them have any leisure for this investigation; and the tribes of vermin are so immensely varied, that naturalists have hitherto been employed chiefly, if not exclusively, in describing their *external* appearances, and in attempting their classification (their natural habits, so far as I know, have been almost totally neglected); and the descriptions given by them have been so minute, prolix, microscopic, and expressed in such hard Greek terms, that the plain farmer is only puzzled, tantalized, and disgusted by their volumes. And, indeed, till the subject is deliberately taken up by intelligent practical farmers, who have their personal interests pending on the inquiry, we need not expect to see it treated in a manner really beneficial to agriculture. The unassisted and unencouraged exertions of any one individual cannot be expected to accomplish much in a field so extensive; and I dare not promise in this paper to add much to the present scanty stock of information. Yet if I state a *few* facts, and draw useful deductions from them, my attempt may stimulate others to proceed farther.

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* Within these two days, we have heard that this woman had been taken up as an impostor.

The *larvæ* of the crane-flies are almost the only species of grubs known to be extensively hurtful in the fields. These grubs breathe by their hinder extremity, by small pores having coverings fitted to protect them while the insect mines its way below ground (this shews their adaptation for creeping below ground); while slugs breathe by an orifice near their front, through gills (this shews them little fitted for working their way under ground). Grubs feed on the tender *roots* of the grasses (including corn); while slugs devour the tender *leaves*. Grubs feed wholly *below* ground; while slugs feed chiefly, if not wholly, *above* ground. Grubs are killed by moisture only at the time of their first transformation (into the *pupa* state); slugs cannot at any time live without moisture. Grubs never come above ground, at least during the day; slugs, in *wet* weather, are seen above ground at all hours, and in *dry* weather they came out at night or during the dews. Grubs can live for a time and crawl freely in *dry* soil; slugs have a slime on their body which unfits them for creeping except on moist surfaces. Grubs begin to live in October or November, and do most injury in April and May; I know not when slugs begin to live, but in the middle of February they are little larger than pin heads, and do no material injury till June, or the end of May. The slug here referred to is the common white one, which injures the turnips, oats, and wheat. About the middle of August, the crane-flies leave the husk of their *pupa* (or dormant) state. The female, according to Mr Stickney's observations, is then already big with eggs. The males vastly outnumber the females; but each female contains some hundreds of small black eggs. She is then too heavy to be able to fly far, and therefore deposits her eggs in several spots, all near to the place where herself burst into the fly-state. With her hinder extremity she makes a small hole close by a grass plant, there deposits a few eggs in the ground, passes on a small distance, deposits a few more at another grass root, and thus continues till all are deposited. Instinct has taught her to bury her eggs only where the young *larvæ* can readily find suitable food. These eggs are generally deposited between the middle and end of August. About eight or ten weeks after this, the *larvæ* burst from the eggs, and feed on the tender roots of the grass where they come into being. If the weather be mild and humid, they make considerable progress before the frost lock up their food; but no severity of frost can kill the insect in this stage. It remains stationary, perhaps in torpor, during the dead of winter, and is revived with vegetation in spring. It then increases in sixe till, early in May, it is about an inch long and one-third of an inch in girth. By this time it is very destructive, both in pastures and in corn-fields, although its ravages are most marked in the latter. It gnaws the roots and kills the plants. Between the 20th May and the middle of June (the period being partly influenced by the weather and the supply of food in the previous spring), these larvæ pass into the *pupa* or *aurelia* state. They now secrete a thin husk which forms around them, and in it they lie dormant, or at least harmless, till they are ready to burst forth in the perfect fly or imago state in August. The period when they enter into the pupa state, is the only time in which they are in danger from the weather. At any other period wet and cold weather has no effect upon them, but at this stage it is exceedingly fatal. It is supposed that only those in dry and sheltered spots survive the effects of rain at this season every year. I very much doubt this. The extraordinary devastations occasioned by grubs in 1800 cannot be accounted for on any supposition hitherto advanced. Had the above supposition been correct, the cold rains of May and June 1799, should have killed most of them, caused the deposition of few eggs, and rendered grubs peculiarly few in 1800, whereas the reverse was the fact. The larvæ dwell about one inch below the surface. In moist, clayey, and mossy soils, where excessive evaporation carries off heat and retards the growth of grasses in spring, this grub injures the roots of all the most tender and early grasses. This is probably one cause why the "perennial" rye-grass dies out so soon on most soils. This is the earliest and, of course, the most tender grass in spring, and affords a pleasant food to the grub. These remarks partly explain the cause of the deterioration of our pastures, by the gradual extirpation of the most tender and valuable grasses on our heavy soils. Yet I have reason to believe that the want of genial warmth and an excess of unwholesome moisture contribute, in many cases, fully as much to this as the grubs do. And in very moist situations, where only sprat and aquatic grasses grow, and where the sward is mown in August for hay, the grub has no part of the blame, for it does not there exist; at least I never could find any grubs in such meadows. The female will rarely drop her eggs at the roots of such plants. When old pastures, or even clovers on strong soils, are ploughed for white crop, the eggs of these insects (if the ploughing is during the period of the egg state) are turned over with the furrow slice, and many of the grubs come forward in due time. Many will be killed by being buried too deep, especially if the slices are well laid down. If the ploughing take place in November, or while the grubs are very young and weak, the same effect will happen, the greater number will be buried too deep to be able to rise to the top. This explains the cause of the utility of the "furrow-presser" used in the west of Scotland. It lays the slices so closely together, that most of the grubs are smothered while tender. But if the lea-ploughing is deferred till late in the spring, when vegetation has given strength to the grubs, and then, if the slices are ill laid over, a host of grubs is unavoidable. I doubt whether the advantage of winter pasture, even on our best leas, is not more than counterbalanced by the injury done by grubs (and, as we will soon see, by slugs) to the next oat crop. I have more than once seen a whole crop so destroyed by grubs, that the field had to be reploughed; and that, too, in a district where not only rooks abounded, but where the proprietor, in his zeal to preserve the game, did not allow one of his tenants to keep a gun!

Nothing can be more unfounded than the opinion that the rooks, either in winter or in spring, destroy grubs to any valuable extent. The grubs work *below the surface*, where the rooks cannot reach them. I have had good lea of four or five years old. I have often gone over it in spring, and attentively examined it with a magnifying glass where I knew that grubs abounded, yet I never saw one of them above ground. But when I cut the turf, I found plenty about an inch from the top. The grubs are said to come above ground *at night*; and it is in belief of this that farmers roll their oat-fields during night, in hope of thus killing the grubs. And they tell us that the roller becomes clagged over with the bruised grubs. It might be worth their while to ascertain whether they had not killed earthworms and slugs instead of grubs. In young oats, I have sometimes found a grub within half an inch of the top; but I never knew a case of rolling decidedly killing the grubs to any great extent. On heavy clay soils, rolling, though it does not at once kill the grubs, will so compress the soil that the injury done by them will be greatly diminished, and (if the ground is not rolled till after the plants are fully formed above ground) vegetation will thus be allowed to advance with little injury from them. But where the soil contains light moss, rolling *for grubs* is utterly useless. But rooks so seldom visit the lea-fields in winter or spring, that their visits are by country folks viewed as portentous of storm. How, then, can any maintain that they destroy grubs in winter or spring? I have felt interested in seeking to discover what rooks are employed about on these occasions, and therefore I have followed them to the spots where they alighted, sometimes immediately after they sat down, and at other times after they had been for some time on the ground. I found many casts of earth-worms, and sometimes several small white slugs on the surface, but no grubs; and my conclusion from these observations was, that the rooks were employed in seeking earth-worms, and *perhaps* small slugs. I express doubt of their eating the slugs, because I have never heard of any person who ever saw a rook take a slug in his mouth; or had any satisfactory evidence that they ever taste slugs. While, on the contrary, every ploughman has an hundred times seen them devouring earth-worms. The rooks have in winter been accused of rooting up whole crops of clover. If they were then in search of grubs, their services were dearly bought. But who ever saw rooks tear up grass on *old lea*, where grubs chiefly abound! They have not *strength* enough for this. And, without tearing up the grass, they cannot get the grubs at its roots. How foolish would it be, how unlike the sagacity of rooks, to labour so hard for grubs, at a season of the year when an hundred (I may say five hundred) would scarcely be a meal to one of them, and when they can so much more easily tear up *wheat* plants, and get plenty of earth-worms. But if the rooks do not eat grubs in winter or early spring, I am told that they take them afterwards to their nests and feed their young with them. I believe there is some little truth in this. They turn over a few of the clods *after*, but not before, the oats germinate on the sown fields, and below these they find either grubs or earth-worms; but after germination it would be vain to expect many grubs under clods. By far the greater part of them are then dispersed over the soil and preying on the roots. I sowed a few acres of a five-year-old lea field on 17th ult., and have often examined it since: and I *aver*, that during the first week after the seed was harrowed, I found *many*, I may say hundreds of places *scraped* by the rooks, exactly as the hens scrape; and, from attentive inspection at different times since the oats germinated, I estimated the average number of grubs on a square foot of the sowed ground to be at least *ten*, and the average number which the rooks *might* take, by turning over the clods, one on every ten or twelve square feet of surface. It is easy to distinguish where clods have been moved after rain has fallen on the soil. The above estimate makes it *impossible* for the rooks to take morethan *one per cent.* of the grubs from the germinated oats; a *small* compensation for the mischief done by them at all seasons! If any person doubt that so many as *ten* grubs may be found on a square foot, Messrs Kirby and Spence will tell him that 210 have been found on one square foot.

It will naturally be inquired, "how are we to save our crops on fields which have been *late* ploughed, and where we find grubs abound? I shall copy part of an article from the *Northern Agricultural Magazine* for September 1828, as describing the best method I am acquainted with:—"During the last fourteen years" (says the writer), "I have invariably got rid of them (grubs) by dibbling; and though in 1818 I had upwards of sixteen acres which, to all apearance, were gone, so much so, that my neighbours advised me to plough them up, I persevered, had an excellent crop, and sold the whole for L.11, 14s. per acre; while those around me, who persisted in rolling during the night, sustained a total loss. The process is simple, and the expense from 3s. 4d. to 4s. 2d. per acre. When the braird turns sickly and yellow, be assured the grub has been busy. Lose no time in rolling (which is merely to smooth and firm the surface), then put two or three women on each ridge, according to its breadth, with iron-shod potato dibbles, and let them proceed, entering it about six inches, and turn it round, leaving the holes entire and smooth, and about twelve or fourteen inches separate every way. As night approaches, the worms (grubs) move about, and falling into the holes, remain there. I have often found eight to sixteen in each. In the morning they soon die, and in the course of the day, they have the appearance of a spoonful of common train oil. And unless it be from this very substance affording additional nourishment to the roots, I am at a loss to account for the crop, when thus infested and treated, being always the best in the field." One chief obstacle which has prevented the adoption of the above method, is the difficulty of sparing hands for it in the time of potato seed labour; at least this has hitherto prevented me from practising it. On light dry soils, like many in this country, grubs would seldom do any material injury, although a rook were not in existence; and, therefore, the dibbling on them is unnecessary, and could be of little use (even if it were needed), for the small stones would prevent the descent of the dibble, and the hole would soon be left clean. But on our heavier and colder soils, and on old pastures, I have no doubt but it would be of great service. Light soils, if at all dry when sown, should be rolled as soon as the harrowing is finished. But rolling on heavy soils is unsafe, till after the plants are above ground. Germination always needs a free supply of air, which, on heavy soils, the pressure of the roller would exclude, and thereby diminish the crop, or cause an unequal braird. A farmer, a few days after sowing, can easily ascertain whether the grub is numerous in his lea oats. He may then, as soon as the plants are fully above ground, roll and dibble. The expense is a mere trifle, when compared with the amount of injury done by the grub on such soils. And were the work done thus early, it would less interfere with potato labour. If, as the writer says, it converts the enemy into a good manure, it certainly serves a valuable purpose to the farmer. But independent of its destroying grubs, it must be of much use to heavy and impervious soils, by letting the moisture more completely through them, and to a certain extent giving them the characters of light soils.

I shall now state a few facts respecting the farmer's enemy, the white slug. I have mentioned the supposition that rooks *may*, in winter and in early spring, eat a few small white slugs. I *know* that they devour earthworms at all seasons of the year, because I have often seen them follow the plough and pick them up; but I *never* saw them eat slugs, though I have often seen them pass places where slugs abounded. Therefore, I consider their eating slugs as a mere *supposition* unproved. But it is no supposition; it is a notorious *fact* that their services against the slug are utterly without value to the farmer. The facts of last season alone may set this question for ever at rest. The winter and spring of 1840, mild and moist till 15th February, gave the rooks at least the usual facility of destroying slugs; but what were the effects? I had a field of four-years-old lea, a superior gravelly loam, pretty uniform in quality, and only from three hundred to five hundred yards' distant from an extensive rookery. Circumstances compelled me to plough and sow this field in different lots, and at different times. Lot 1st was ploughed between the 9th and 13th of March, and sowed on 30th and 31st. No slugs were on its plants on 29th June; at least I found but one slug in going over four or five acres, and the plants had no appearance of being in the least injured by slugs. The crop on this lot then looked fully equal to any in the district. Lot 2d was but one ridge on the north end of lot 1st, at least equal in soil. It was both ploughed and sown on 31st March. It had, on an average (on 29th June), about one slug on *each* oat plant. Lot 3d consisted of a few acres contiguous to lot 1st, on its south end. It was ploughed on 13th and 14th March, and sown on 14th April. It had on an average about three slugs on every two plants. Lot 4th, also a few acres, was ploughed between 23d March and 12th April, and sowed on 13th April. It lay west from lot 1st, and separated from it only by a patch of dry meadow. It had fully two, or perhaps nearly three, slugs on each oat plant. Lot 5th lay south from lot 4th, was ploughed between the 18th and 21st March, and sown on the 20th April. I am sorry to be compelled to state that the slugs on this lot as exceeding *four* on each oat plant! The appearance was most melancholy and disgusting: Every blade was more or less injured by the slugs; many blades were stript so, that only some thready fibres remained; and many were half withered! The plants were very strong in stem, yet many were half bent down with the weight of slugs on them. Need I tell the rook-advocates that *these* were the slugs which injure the corn, and *these* were the slugs which rooks *will not eat?* For, as I stated before, the rooks passed over them every day, yet *not one* would light on them! The slugs were set up to *tempt* the rooks, but the temptation was *vain!* How long will some men adhere to absurd notions? The appearance of the various lots in August was conformable to appearances in June. If lot 1st had not been extensively injured by the rooks after it was lodged, it would have yielded an extraordinary crop; but the rooks were daily in thousands on it by the first dawn of morning, and before any "boys" could have been depended on to watch them. The lots injured by the slugs did not ripen equally; and, after waiting as long as possible, we had to cut much of the corn green, and a large proportion of it was only *empty* husks. The whole *seed* was the potato oat, of pretty similar quality. Part of all the lots has been thrashed; none of first lot was weighed; and all has been used as seed. The servants maintained it would weigh 44 lbs. I am certain it would exceed 42 lbs. Lots 3d and 4th averaged 40 lbs., and lot 5th

38lbs. per bushel. In a showery harvest like last, when we are obliged to lead whatever is ready, it is perhaps impossible to form a perfectly accurate estimate of the comparative value of the different lots. The plants in harvest were so much thinner on the slug-damaged lots, that much grass grew up with the corn, while not a pile was to be seen on lot 1st. By comparing the weight and number of bushels as nearly as they can be ascertained per acre, if I state the value of lot 1st at 100, lots 3d and 4th would rate 70, and lot 5th only 50. So that, if lot 1st was worth L.12 per acre (and I was offered more than that for it), lots 3d and 4th would be worth L.8, 8s.; and lot 5th worth only L.6 per acre! As this cannot be far from the comparative value of the lots, it shews considerable loss chargeable on slugs. But I see I have just made a mistake; I supposed the 1st lot worth L.12, *not after* the rooks had injured it, but before. Hence the above comparison is less correct than I supposed; for I have no means of estimating the injury done by the rooks, and it is unfair to compare the first lot, *thus* injured, with the other lots injured by the *slugs*. But I have stated enough to allow any intelligent farmer to come to a pretty correct opinion of the matter, and none else will mind it. Facts must be attentively observed, accurately stated, and deliberately weighed, before we can form any correct theory. I had written a plausible explanation of the above facts; but, on second thoughts, I have seen it liable to objection, and I suppress it. So many things yet require to be known respecting the natural habits of the slug, that I am not a little puzzled.

It would be of some importance to know whether the slugs which injure the corn arise chiefly from between the furrow-slices *in* the corn field, or whether they chiefly come from the neighbouring grass fields *to* the corn. The fact that slugs (as far as I know) never injure corn after fallow, but always after lea or clover, seems to favour the *former* supposition, and the fact of lot 1st being entirely free from slugs, though as much exposed as the other lots, seems also to favour it. But, on the other hand, the injury done in *gardens* by slugs, where the enemy must come chiefly from without, seems to favour the second hypothesis. The most important *indisputable* fact is, that they injure only the *tenderest blades*. After warm and showery weather in May has caused a *rapid* growth, the corn blades are very tender, and the slug finds them a pleasant food. The tenderness of plants is greatest when they are very young. Hence late plants, which have *rapidly* sprung up under the heat of May, will be more tender than plants which formed their leaves earlier, when less heat and moisture were present. This shews the importance of early sowing, especially on lea, if it puts the plants beyond the reach of the slug. But again, the fact that wheat after fallow is *not* infested, while wheat after lea, or clover, or beans, is sometimes nearly destroyed by slugs, bears in upon the mind the conviction that the slug arises from the *soil* on which these crops grew. It would lead one to conclude that they, like the grubs, lay their eggs in the soil where they fed during the former season, and that these eggs yield young slugs at some very early period in the season. The fact of my finding many slugs, no bigger than large pin heads, in the grass in February, favours this notion. The inference from this is, the importance of *early* ploughing for spring crops. Early ploughing, where the ground is exposed to the winter frost, is a substitute for lea *fallow*, to a certain extent. And where wheat is sown early, and after ploughing lea or clover, the plants rise before the ground has had the advantage of this partial fallow. The practice of grazing sheep in winter tempts us to defer ploughing our lea as long as possible. This must be very bad economy if the above views be at all correct; for all that we can gain from them by winter pasture will not exceed 6s. or 7s. per acre at farthest, and in seeking to gain this, we may lose *ten times* as much by the grub and slug in our next crop; and it is hardly possible to conceive that our loss will ever be so little as double the gain from pasturage. But if the rooks ever clear our lea fields of grubs or slugs in winter or spring, the longer they are *un*ploughed the better; for the good rooks will have the more time to *clear* them! Oh! oh! what will not some men believe? Some one may object that the inferiority of my slug-injured lots was more chargeable on late sowing than on slugs. I deny this. I had a fallow field sown with oats, two days *later* than lot 5th, and yet it suffered no injury. Besides, it is well known that if the leaves of berry bushes be eat by caterpillars, these bushes will ripen little or no fruit in that season. If trees are stript of their leaves, or have the leaves injured by a storm in spring (as happened on 10th and 11th May last), these trees will look as if dead the whole season. Why do plants send out leaves? The leaves are needed to elaborate the sap which ascends from the roots. Hence if the leaves are stript by slugs, the sap will not be elaborated, the plants will make little more progress, and the corn will not be ripened.

Having considered the means of *preventing* the ravages of slugs, it may be expected that something should be added on the cure or treatment, when the slug has been found on the plants. I am sorry I know of no universal remedy for this. On turnips a good powdering of *quick lime* will at once remove the pest. But here a *cart* can be freely brought along the ridges, and scarcely less than 32 imperial bushels will be found necessary for an imperial acre. As lime may be needed on the fallow, this may be no loss. A writer in the *Northampton Herald*, last year, recommended "to sprinkle slaked lime over the land—in the same manner as sowing broadcast—*night and morning* for *two or three days* consecutively." This if for land in *wheat*. A man must go over the field *four to six times*, and sow it as often with lime! This advice smells strongly of the nursery. [Gardeners are great farmers. One of them complained lately that if he should beat us in a mortar he would not get us to do what is right.] I shall only suppose that each morning and evening the farmer sows, with his hand, ten bushels of lime-powder per acre. Pray, who "serves the seed?" What if the wind be in his face? Will not all this trampling down of the crop destroy it as much as the slug will? And then what is the cost? But enough of this. Gardeners, with all their hair-ropes, soot, lime, and lime-water, are often unable to protect a few falls of ground from the slug. "Prevention is better than cure." The above facts tend to shew that the farmer's only reliance for avoiding both grubs and slugs, should be placed in early ploughing. But we yet need an accumulation of well-recorded facts, before we can attain a sufficient knowledge of the slug. And farmers would confer a valuable benefit on agriculture, if they would publish what facts they have observed, from time to time. If I had leisure, I would shew that the accumulation of field-mice is chiefly, though indirectly, chargeable on rook protectors. *Owls* are needed to take the field-mice. Rookeries are fatal to owls. The wire-worm also needs more attention.—*Dumfries Herald, 22d April* 1841.

III. *On the Choice of a Horse.*—Mr Stewart delivered a lecture on the Choice of a Horse, at the School of Arts, on Tuesday evening the 31st August. After a short preface the lecturer said—"I would address myself to those who are not particular in their choice of a horse. They look at the animal, and if his appearance please them, the only other thing they regard is the price, and that being reasonable, or supposed to be so, the horse is purchased. He *may* be a bargain; but in ninety-nine cases out of a hundred, horses bought in this careless way, are bought for more than they are worth; and very often the purchaser finds, when too late, that the horse is not at all suitable—not fit for his master's work: he may be too old or too young; he may want strength, or he may want speed, or he may want endurance; he may be lifeless, vicious, unsound, unsafe, or uneducated. How all these things are to be discovered before the horse is purchased, cannot be told in two words. After a general glance, in which you judge whether the horse's size and strength be suitable for his work, and whether his general appearance please you, the first thing to be considered is,—

The Age.—Horses arrive at maturity at about their fifth year—some a little sooner, some a little later. Before maturity no horse is fit for full work. At four he may do as much work as at five, yet, if he do it often, he becomes lame; his bones are not sufficiently consolidated; his joints not firmly knit; his muscular system not fully developed. In this country, and in every other, horses go to work before they arrive at maturity, and it is very proper that they should do something; but if a continuance of full work be exacted, either some part, weaker than another, gives way, and the horse becomes lame, or the legs fail generally, become distorted, unsteady; the horse trembles on them, even when standing quietly in the stable, and his action is shortened, crippled, confined; he cannot step freely out. In this town horses are often brought to the market at two years old, and very likely sold to some person who makes no allowance for the tenderness of youth, or perhaps never thinks or enquires whether the animal be old or young. It is therefore very obvious why so many horses are ruined, both in body and spirit, almost before they arrive at the age of maturity. I should say that no horse, even in this country, is fit for any thing like work till he is three years old that at four years, he may do moderate work; and at five, full work. By this calculation, I allow the horse to reach maturity a full year sooner than in Britain, where the long and cold and hungry winters make that much difference. How long a horse will remain in his full strength and spirit after he is five years old, depends partly upon his constitution, and greatly upon the treatment he receives. Some remain good till their twentieth year; and I have seen one or two young at upwards of twenty-five. In this country, as he reaches maturity sooner, it is probable that his day are fewer, though that is by no means certain. From all that I have yet seen, I suspect that the most of horses begin to fail in spirit and in strength soon after they are ten or twelve. If badly used they will fail sooner. An old horse, whether his age be produced by lapse of years, or by hard work, is fit only for short journies and light weights. It is always difficult to keep him in condition; if he do one good day's work, one night's rest does not, as formerly, restore his vigour; he must rest next day. On a journey he must be often fed and often rested; long journies he cannot perform, and long fasts make him quite useless. Exceptions no doubt may be heard of, but they are not common. An old horse, however, is very good for those who are only learning to ride or to drive; for he is generally steady, having no youthful pranks, such as shying, starting, jumping, frisking about, or running away; and no vice such as kicking or biting. He cannot be bothered with these things. He knows his work, and if left to himself will do it better without than with the assistance of a bad driver. Most of the accidents to which equestrians are liable arise from an unskilful rider attempting to command a young horse; neither the rider nor the ridden knows very well what he is about, yet each has a will of his own, and it is no wonder that the one or the other goes sometimes wrong. I would recommend every one to get his first lessons in riding or driving from an old horse. He is a good teacher; and will do his pupil more good than another whose appearance may be somewhat more ostentatious. You must not expect long lessons from him, and you must change him for another so soon as you find yourself able to ride comfortably and fearlessly farther or faster than he can carry you. In choosing an old horse, be sure that he is not so far gone as to have lost the use of his legs. Let a friend, a better judge, try whether your purchase, or intended purchase, steps out freely and firmly, and chooses his steps with attention to obstacles in the road; one trip is nothing, but if the horse flounders about as if he expected a beating, he is an old stumbler, and has often been beaten for it. I would not advise a friend to choose him. The age of the horse is ascertained by examination of his teeth—the six teeth placed in front of the lower jaw: they undergo certain changes, which, from six months up to eight or ten years, occur most generally at regular intervals; and to a later period, at less regular intervals.

[This part of the subject was illustrated by exhibition of the mouths of horses at different ages, from ten days of age to eight years and upwards.

The tricks of dealers to make the horse appear younger, and of others to make him appear older, were described; and some remarks were made upon signs by which the horse's age is indicated, independently of the teeth—such as by grey hairs about the head and legs, hollowness of the back, drooping of the upper lip, and lifelessness of action.]

Action.—The action of the horse was mentioned as the next thing to be considered after the age. Three kinds of action were spoken of: *high, extensive, free.* It should be high that it may be safe, the horse lifting his feet well up and clearing the ordinary inequalities of the road; it should be extensive, that the horse may be fast, his feet thrown well forward, his strides long; it should be free, the foot projected straight forward, not wandering to either side, and not taking sometimes a short step, sometimes a long one, but advancing steadily, and looking as if it were under perfect control while in the air.

Shape.—" After the age and the action, you have to regard the form or shape of the horse. By certain peculiarities in the shape we judge whether or not the horse be *strong, active, hardy, lasting, easy,* and *safe.* These five qualities are derived in a very considerable degree from the conformation. It is the shape of the horse which confers them; at least peculiarities of shape will forbid them. No horse, for instance, can be lasting whose legs are badly formed. He may be strong and swift and hardy, but these qualities do not prevent his legs from wearing out. Strength, speed, and endurance, are regarded as the three most important properties of the horse. Many persons confound strength and speed one with another; they talk and think, if there be any thinking in the case, as if a horse must of necessity be swift who is strong, or strong if he is swift. A very little consideration is sufficient to shew that the two properties are quite distinct. The greyhound will run as fast as the horse, a swallow flies nearly three times faster than either of them; and there are many small animals whose motions are much more rapid than the motions of others ten or a hundred times their weight and strength. Now we find in the horse certain peculiarities in the shape which confer swiftness of action, and certain others which confer strength of action; and we find farther that the form which is most adapted for strength is least fitted for speed. The enormous strength of the draught horse can never be combined with the speed of the racer When you want much of the one, you must sacrifice some portion of the other. The two properties exist in almost endless varieties of combination, and he chooses best who chooses an animal in whose form are combined the greatest degree of speed with the greatest degree of strength. If swiftness alone be the object aimed at, the more the horses' form resembles that of a greyhound the better. But if strength alone be sought, then the horse should have more resemblance to a bull-dog. For speed, the head should be small, the neck thin and light, the body slender and long, the legs long, and the feet small. For strength, all this, the head excepted, should be entirely reversed. The neck should be short and thick, the body deep, broad, and short, the legs the shorter the better, and the feet large. Endurance, the third property to which I allude, is of two kinds. A horse may have strength and action, as much of each together as the most of good horses, and yet he may not be able to endure continued exertion as well as others. If his chest be deficient in capacity he cannot run a long race; he cannot continue any active exertion so long as another with a chest of more capacity. He becomes breathless; and after that his strength and action avail him nothing; they depart from him. Another horse, strong, active, and well chested, may want endurance of a different kind. His legs, though strong, may not be made to stand a continuance of hard work; he may do the work, hard as it is, for years, but his legs fail long before the horse arrives at old age—before his spirit and bodily strength decline. In Glasgow the mail contractors used to regard three years as the average service of their horses; that is to say, if the stud contained two hundred horses at any given time, two hundred horses would have to be purchased in the course of the next three years, in order to keep the stud in good working condition. Several, no doubt, were serviceable twice as long, but some failed in half the time. A very large proportion of these horses had to be cast, not for deficiency of strength or action, but solely for decay in the legs. In and about Glasgow, however, the horses have very badly formed legs. If they were better at first, they would stand work much longer. Then, you perceive, the horse is to be chosen whose shape is best adapted for the work he has to perform. But we will consider this matter a little more in detail. If you would learn to judge of the horse's conformation, you must consider all parts of him, the essentials and the minors; and the right way to learn, is to contrast one with another, selecting for this purpose at first a dray-horse and a racer, as in these two you will find the differences of conformation most broadly marked."

[Here the lecturer described at considerable length varieties in shape and outline, as related to speed, strength, action, safety, and endurance. But as this part of the subject cannot well or usefully be treated of apart from the collection of plates by which it was illustrated, we omit further notice of it.]

Education.—" Having ascertained the age, examined the action, and seen nothing decidedly objectionable in the conformation, the next thing to be considered is the education. To an inexperienced horseman, or to one who rides for pleasure or for health, it is of the utmost importance to get a horse that is well acquainted with his work. It is true you may purchase a young unbroken horse, and let the breaker prepare him for you. That is very well for a good horseman, who is willing to suffer the awkwardness, and able to correct the timidity, or wilfulness, or obstinacy, of a young horse. But it is not advisable for any other. Among the people who break horses a great many do not half know their business. They seem to think they have done enough when they have got the colt sufficiently subdued to carry the saddle, or run in harness; and those who know better, those who fully understand their business, will tell you that no horse can be thoroughly educated in the time usually allowed for the process. The time allowed varies from three to six weeks; but every experienced horseman knows that horses will improve in their education for a year and more. No breaker is allowed to keep the horse so long under him. He does so much, and leaves the master to do the rest, and the master does it, if he be able and willing; but unless the purchaser be both, he had better purchase a *second hand* horse, one who has not only been broken, but also worked, and if he has been worked by a man who could and would take some pains with him, you will find him a much more useful and pleasant animal than any you would get fresh from the hands of the breaker. A person, therefore, who would ride or drive quietly and comfortably, should always prefer the second hand to the new horse. There is an evil to be feared, however, on the other side. Some people ride so ill, so careless of themselves, and so inattentive to their horse, that instead of improving the horse, they make him worse than he was at the first, —still this is not so common, and therefore not so much to be feared, as the awkwardness, the stupidity, and the wilfulness of a colt newly broken. You cannot judge of the education without a trial. When a trial is not obtainable, something, though not much, may be known by observing the conduct of the horse while he is led or ridden by another, see if he obey the bridle or collar rein; if he stop at once when he is checked; if he advance whenever he is commanded; if he turn to one side or the other without much bend of the neck, or looking as if he were turned by main force. A horse well mouthed, and of a good disposition, may have a will of his own, but he never shews it in opposition to that of his master. To every, and to the lightest touch of the rein, he yields implicit and prompt obedience. This is a very desirable quality, and you may meet with horses having it in great perfection. Observe also if he heed the voice of his attendant. If you see that he heeds neither rein nor voice, or that he answers tardily, you may justly doubt whether he is thoroughly educated. But there is no certainty without a trial; and if you desire a good horse, it is much better to give a few pounds more for one that you are sure will please you, than to purchase at a lower price one that you know nothing about. When a trial is possible, mount the horse and start at a walk. See if there be any lameness, for it is most likely to be discovered at starting; after the horse is out a bit, he disregards a slight lameness, and does not shew it. Observe next how he walks, if he step well out, taking a good long stride; if he walk smartly, four miles an hour is good walking, and five miles is very fast; see if he set down the foot all at once, the heel rather sooner than the toe; see that he do not trip often while walking; observe also how he carries his head, and bears upon the bridle; if he carry it low, or bear heavy on the rein, as if he meant you to carry it for him, be sure you will not like him. He will not be pleasant to ride; he is not well broken; take him through the streets, slack the rein a little, and see if he go straight forward, not wandering from side to side; if he attempt to turn off at every opening, or stop at public-house doors, that is a thing to which he may have been accustomed, and you are not to suppose him bad for that; but if he refuse obedience to the rein, either persisting in his own way, or yielding with reluctance, then he is not well taught, he has been badly mouthed, or he is of an obstinate disposition, and has never been entirely subdued. Take him next through a crowded street, still at a walk, and notice how he passes carriages and horses; he should himself incline to pass them on the proper side, but this is a thing which horses learn very slowly, and it may be forgiven him if he has not learned it. He should not start, stop, or shy at objects of any kind. If he do, he is either uneducated, or too timid ever to be fully educated. Strange noises may be allowed to produce some animation in the horse's manner, but if they make him restive, disobedient, or wilful, do not have him. His timidity or awkwardness will get you into a scrape. From a walk, you urge the horse to a trot. Trotting seems not to be a favourite pace in this colony; and I see very few horses that trot well, but whether that arise from want of practice or from some fault in the horses, I know not. The unevenness of the roads, which forbids trotting, and the difficulty of getting good trotters, concur, perhaps, to render the canter a more common pace than the trot. Nimrod, a celebrated writer upon horse affairs, has said that the trot is a pace fit only for a butcher. Why it should be fit for a butcher and not for any other person, he does not tell us, and perhaps it will not be easy to find the why. But nevertheless the trot, when well performed, is with the most of good horsemen in as much estimation as the canter; and I think for long journeys it is a better pace, not exhausting the horse so soon, although it requires a little more exertion of the rider. There is great difference in the trot of different horses; in one it is easy, in another rough; in another quick, in another slow; and in very many horses, especially in this country, it is neither one thing nor another, but a curious provoking sort of compound, composed of shuffling, trotting, walking, creeping, and cantering, all in one. It is meant for a trot no doubt, but is a sorry imitation. You would suppose the beast had never tried it before; his legs flounder and scramble as if every one were fighting with another; and the motion altogether is so odd that you can hardly tell which way you are going, whether forward or backward, to the right or to the left. If you want a trotting horse, you will, of course, have nothing to do with a beast of this sort. He may nevertheless be a good canterer. The canter, the walk, and the gallop, are natural paces; the trot is altogether produced by training, and you need not therefore wonder that the trot is often worse performed than any of the others. In some countries horses are never taught to trot. The horse is usually taught to canter with the right foot forward, but that horse is best taught who changes from the one foot to the other, sometimes with the right, and sometimes with the left in advance. When well trained, the horse is what they call *collected* in his canter—that is, leaving the ground and meeting it without any jerk; you are not jolted out of the saddle, and you find no difficulty in keeping the stirrup still, not oscillating back and fore like a pendulum. After the canter, you may try the gallop for two or three hundred yards. It should be performed in long steady bounds, without jolting, and without irregularity. An inexperienced galloper takes a short stride, and makes a great fuss about it, and while all his strides are confined, some are shorter and some are longer. But the gallop is a pace little used except in hunting and racing. For the most of saddle horses two paces are enough; he must walk well and he must either trot or canter well.

After the trial gallop you pull the horse up; let him stand for a moment, and slack the reins. Then cast your eyes upon the fore legs; if they be weak or badly formed, they will tremble. I have seen them shake so much that the horse could not stand on them; he is obliged to throw all the weight of the body on one; the weight keeps that one steady, but the other is thrown forward, and it trembles much or little. Some nervous horses will shake a little merely by the agitation of galloping; but in these horses the trembling is rarely perceived in the second short gallop; and you may easily see by other signs, such as champing the bit, pawing the ground, and animation of the ears, that fieriness of temper has more to do with it than any fault in the legs. For any work besides the saddle, the trial must be somewhat different. If meant for hunting, it will be necessary to try how the horse leaps; if for harness you must put him into harness; and if for the cart or dray, you must see that he is willing to draw more than an empty cart. Horses, like men, are addicted to laziness, and it is often an incurable malady. It is proper, therefore, when you are trying one, to notice whether he do his work willingly. If he requires whip and spur at every step, do not have him. To find this out, you should have no company with you, and the trial should extend over a few miles of ground. A lazy horse will often work tolerably well while another keeps him company, and it is not till you travel alone that you find him an incorrigible sluggard. It is the same in harness. Many horses work well in double harness that are useless for a gig. Many cart horses, too, will work well enough in an empty cart, yet refuse to take even a light load through deep ground or up hill. I have known a lazy horse drugged to make him shew a little spirit on the day of trial: a quantity of whisky was given just before he left the stable, and it answered the purpose very well; but though this is a common trick in Britain and Ireland, I know not that it is practised here. You have likewise to be on your guard against a fault quite different from sluggishness. The horse is sometimes too willing to go; he may be well broke, and a most excellent horse when properly mounted; but he has an extraordinary desire of running, and, if you would let him have his own way, he would soon run himself to death. No young and skilful horseman would object to a beast of this sort, for he is one of the best; but gentle and inexperienced riders find him very troublesome, he is so restless, pulls so constantly at the bridle, and is so apt to run off, that a quiet man has no peace on his back, and an indifferent rider has no safety. Before quitting this subject I ought, perhaps, to caution you against mounting, indiscriminately, every horse offered you for trial. The very best riders have at times sufficient reason to be cautious, and I have known many accidents happen in this way; one, a gentleman I knew well, was killed in trying a horse which, though quite manageable, was too headstrong for him. No young rider should mount a horse that he knows nothing about; if he can learn nothing certain by enquiry, he should get some friend, a better equestrian than himself, to try the beast."—*Sydney Herald, Sept.* 24, 1841.

QUARTERLY AGRICULTURAL REPORT.

May 1842.

The weather of the last quarter may be characterized as dry, very little rain having fallen; and yet the drought has not been of the blighting character of last year at the same season, which shrivelled the young leaves of trees, and discoloured the tender spring-corn amidst the brightest sunshine. Though the drought this season has been constantly accompanied with an easterly wind, there have been slight showers, occasional mists, and frequent heavy dews, which, though attended with a low degree of temperature which has checked vegetation to an advanced period of the season, have nevertheless promoted it with progressive regularity. The consequences are, that vegetation bears a luxuriant aspect, especially in the blossom of forest and fruit-trees, which have displayed a richness of colour and vigour of growth much superior to that of several years past. The calm and gently moistened state of the air during the existence of the blossom, together with the lateness of the season, betoken a favourable issue to the crop of fruit; and should the summer's sun prove as genial as the gentle air of spring has already done, the native luxuries of our country will be enjoyed in abundance.

Nor is the prospect connected with the necessaries of life—with our crops and stock—less auspicious. Both the autumn and spring wheats look well, with the exception, perhaps, on poor hard clays, where the plants are rather thin, though there is yet plenty of time for them to tiller out and fill the ground; this process being best done in a favourable June, of which there is every prospect at present. The spring crops, beans, oats, and barley, also look well, having all enjoyed a dry seed-bed. The new grass, too, bears a healthy appearance, and shews less disproportion in the plants of which it is composed than for some years past. It must have been the fault of the farmer himself, if the ground for potatoes and turnips has not been prepared to a state as clean as a garden, for no vexatious interruptions of weather have occurred to obstruct his operations. As the driest part of the season occurred at the time of potato planting, it is not improbable but that crop may shew some instances of failure this year, if so be that the opinion, which has often been expressed, that the withdrawal of the nourishment from the sets by drought is the cause of its occurrence, is correct. The sowing of turnips is going on auspiciously. We cannot venture an opinion in regard to the hay crop, as it is the month of June which determines its value in this country; but this far we may say, that the prospect of a good one is much brighter than at the same time last year, inasmuch at cut and bunched sown grasses is already offered for sale in Edinburgh. So much for our crops, which are all at this moment in a very favourable state.

With regard to stock, it was anticipated that the turnip crop of last year would bear very little eating, and that, in consequence, it would be consumed long before the grass would be ready to receive the stock this spring. In anticipation of this deficiency, we believe that a much greater quantity of oil-cake has been used this winter in the feeding of both cattle and sheep than was ever known before in this portion of the kingdom. On account of the high price at which winter stock were bought in, it was apprehended that little profit would be left to the feeder; but with the exception of five or six weeks, when the panic that seized the purchasers of stock, in consequence of the contemplated changes in the provision laws, produced a stagnation in the trade, fair profits have been realized. It so happened that, during the time of the panic, the grass parks throughout the country were offered for hire for the season, and the holders of stock, dreading a sudden and great fall in prices, rather than part with their stock, competed with one another for the grass, and the consequence is that those parks have been taken this season about 20 per cent. above last year's prices—and it will likely be that the stock owners will incur a loss in this way which they so much dreaded from a fall of prices. It will be seen from the tables that beef and mutton have realized from 6s. 6d. to 7s. 6d. per stone, and the markets are rising. There has not been so favourable a season as this for lambs, both in the hills and the plains, for many years. They are numerous, healthy, and strong, and will help in some degree to make up for the loss incurred by the distemper last year.

With regard to the fluctuations in the prices of stock for some years past, should loss have been incurred by them, we cannot help saying that, in our opinion, much of the blame is attributable to the breeders of stock themselves. Were they to pursue a regular course of breeding, that is, were they to breed as many as their pasture and winter food will maintain, in an average of seasons, the amount of which their experience would soon obtain, irrespective of the current prices of markets, there would be no such fluctuations in prices as really exist; but instead of pursuing this wise, because steady course, they curtail the number of their breeding stock when prices happen to be low, and increase them when the prices chance to be high, thereby themselves producing the fluctuations which they so much deprecate. In this respect they follow the footsteps of the small farmers of Ireland, who raise more wheat or oats as the prices of either sort of grain happen to be most tempting at the time. These observations apply almost exclusively to hill farmers, and more especially to those in the northern counties. The breeders of stock in the low country are circumscribed in their operations by a strict rotation of cropping, and as the members of the rotation followed bear every year the same proportion to one another, a *great* deviation in one member of the rotation cannot be made without materially affecting the rest, and the strictness of this rule applies more stringently to the breeding of stock than the raising of grain. The low prices of wheat some years ago encouraged the growth of barley, which can be grown on the same part of the rotation, and the consequence was, that perhaps not less than 25 per cent. of land has been devoted to wheat for some years past than in former years; and this circumstance, along with the natural deficiency of the crop, has occasioned that scarcity in this sort of grain which has been obliged to be made up by foreign importation. The tendency at present, by the encouragement of high prices, is in the opposite direction, so that in a year or two the former breadth of wheat will again be sown, and we hope that the raisers of wheat will see it to be their interest to maintain as great a steadiness in the culture of wheat as is practicable, irrespective of the current prices of markets. Now, breeders of stock have less excuse than growers of grain to follow this oscillatory mode of doing business; because their produce cannot be brought into the market of consumption in so short a time as grain, and because, hitherto, they have had no competition from abroad to contend with in our own markets, as the growers of grain always have had. If stock-breeders, therefore, would follow their own interests, they would breed up their stocks to the highest number they can maintain in condition, and the immediate consequence of the plan would be a steadiness of supply in regard to numbers in the market, and, by consequence, a steadiness of price, that would at a low figure deter foreign breeders from intermeddling much with our markets. This sort of game can be more surely played by breeders of stock than by growers of grain, as their produce cannot be brought into market in the same year that it is produced, as grain can be; nor is stock so transferable an article as grain, nor can it be warehoused in bond as grain, to await remunerating markets.

We have been induced to express these remarks, in consequence of the panic that seized the agricultural mind in reference to the contemplated changes in the corn and provision laws. The panic in this part of the country was neither great nor extensive, and but few expressions of public opinion were attempted, and in some of these attempts the opinion was expressed in misinformation; as witness the Haddington meeting, where the true statement made by Sir George Warrender, that the income-tax was to be exacted on farmers by half the amount of the rate, was actually disbelieved; and yet it was obvious from the first, that as landlords and tenants were to pay their rates on the same *rent*, two amounts of rates—that is, 1s. 2d. per pound could not possibly, on any principle, be levied on the rent of land, while the value of other sorts of properties were to be subjected to only one rate;

and the smallness of the entire sum proposed to be levied on the rent of land might have led to the same conclusion. It was a proper demand to have the rate levied equitably on the English and Scottish farmers,—the latter paying a rack-rent, is equitably liable to a lower rate than the former who pay many of the burdens in lieu of rent, which the landlord ought to pay. With regard to the probable effects of the two great measures which affect agriculture, the corn-law and tariff, it occurs to us, in regard to the corn-law, that if 20s. a quarter, at and below 50s. is not a sufficient protection to the farmer, against a foreign competition in wheat, that he had better abandon its cultivation altogether; for in these times, when *money* and *manufactures* seem to rule the destiny of the nation, a greater protection is not to be looked for. True, there was apparently a greater protection afforded by the old law, but it was only nominal, for any sum imposed beyond the true protective amount, was nugatory, and gave too reasonable a ground for the taunt, that the agricultural interest was protected much beyond every other interest. Now, however, that taunt cannot be thrown in our teeth, with the least show of reason. It is supposed, that the duties on barley and oats are too low, and whether we shall be able to compete with foreign corn-growers, under the law, as a whole measure, remains yet to be proved; but we entertain no fears, and especially at the present moment, when the desire for agricultural improvement is so strong, that it will not be quenched, or even checked by trifling considerations. Should the new law be able to detect fraudulent returns in the averages better than the old, that circumstance of itself will prove a considerable item of protection, for the returns of the kingdom will now be nearer the truth, and exhibit the prices which the farmer really receives, but which hitherto have been much below those returned, and by which the averages were regulated; but they would have been still nearer the truth, had the returns from Scotland and Ireland been included, and had the prices of the high parts of the country been received into the averages, as well as from the lower and more favoured portions, where prices generally range at a higher mark. There was no proper excuse for leaving out the Scotch returns, as the machinery exists for making them; for, as to the argument of the averages affecting the commutation of tithe in England, the commutation could have been taken from the English returns as formerly, as well as the fiars prices will still be in Scotland. As to Ireland, some means could have been adopted to obtain the prices, for, in a matter of this kind, which is a matter of strict justice and of truth, a reasonable expenditure in the establishment of means to ascertain the truth ought to have been incurred. Had the returns been made as complete as they might be, the clamourers against the *landed* interest would have been shewn that the prices represented by the averages have hitherto never been received by the farmers, but by a class of people whose interest it was to regulate the prices of the market here, so as to suit the circumstances of their own trade, and that trade was not conducted in the produce of our own, but of foreign countries. It is probable that extension of the number of towns in the returns may tend to paralyze the influence of certain parties who have hitherto, in a great measure, commanded the prices of the country; but we own that we would have preferred the returns from the growers to those from the purchasers of grain. From the former class no declaration would have been required of their returns applying only to home grown corn; and as to the objection that the returns from farmers would expose the amount of grain sold by each, we cannot see its force, when we see the farmers of this country annually coming forward in the fiars courts, and declaring *upon oath* the quantities they have disposed of of the preceding crop, up to the day of interrogation.

With regard to the tariff, as we have hitherto had no experience of a trade in foreign stock, we can hardly anticipate the result; but there is this consideration in regard to any change being effected in the provision laws, that the time has gone by when *any prohibitory* regulation can any longer be maintained in this free country. It was the prohibitory nature of the corn law of 1815 that was the most objectionable part in it, and our wonder has been, that in a country where free trade doctrines rule the roast, that the provision laws should have escaped so long unscathed. Had the price of meat kept moderately low, we should not yet have heard of any change in them, any more than we would have heard of an anti-corn law league had the price of the loaf continued at a sixpence; but although the latter contingency of the price of corn is entirely beyond the power of the raiser of corn, we charge the owners of stock for being the cause of raising the price of meat by their short-sighted policy of contracting their breeding-stock, and they may now thank themselves for the rate of prices they may receive in future. As the tariff has not yet been settled, we cannot say what it will prove to be; but 20s. a-head for all cattle does seem a very low duty; and the proposition of Mr Miles, as we understand it, to permit the cattle by weight, and pay duty accordingly, seems a very reasonable one, and for all the number of live cattle that is likely to be imported, would incur no great trouble. A steelyard would weigh their live weights, and after an emaciating voyage, when they would weigh comparatively lighter, a heavy duty should be imposed; or they could be measured in length and girth, and pay accordingly, and the process could be so easily performed, that the custom-house officers would, in a very short time, be able to tell them off by the eye, at least all the beasts in the same lot. But will an immense number of cattle be imported to be subjected to the scrutiny of the steelyard or the tape? Certainly not for some time, perhaps not before two years, as breeders must prepare themselves for the new trade of exportation. It is a curious circumstance that the countries nearest us from whence we may expect any import are very limited in territorial extent. In France the imports of cattle much exceed the exports, and as to the rich *pastures* of Normandy, we never could see any great extent of pasturage at all, the very orchards being under the plough. Belgium is not a grazing country, every field of which rather shews a rooted love of arable husbandry in the industrious tillers of the soil. In Holland there is a good deal of grass, but the country is small, and if the grass were devoted to raising cattle for this country, it must be done at the cost of curtailing their own favourite dairy operations. The Dutch may export calves, and the very high price which veal realizes in this country may tempt them to do it; but they will not likely part with their cows, but at tempting prices which can only be offered by our short-horn breeders to cross with our own stock. In this respect the importation of Dutch heifers and cows would confer a benefit on this country in the introduction of a fresh strain of blood. From Holstein an importation may be expected, but the country is small, and should her breeders prefer sending their cattle hither instead of to Hamburgh, where they have hitherto sent their spare beasts, the rise of price at Hamburgh, in consequence, will prevent the exportation of beef from that celebrated, but at present ill-fated, city. We hear mercantile people express it as their opinion, that large quantities of salted meat will be brought in future from Russia and America, which will be used by the shipping which frequent distant ports; but salt meat will find but little favour from the mass of the people of this country, or even from the coasting marine, who invariably prefer fresh meat. But be the result of the tariff what it may, one thing is certain, that butcher-meat is too high priced in this country, placing it not only beyond the means of the labouring, but of a more independent class of people. Any sum beyond sixpence a pound for the *best pieces* is too much, and if we cannot raise sufficient for the consumption, meat must come from abroad, but if we can, which we believe, then let our breeders shew it, and the effects of their efforts will be best exhibited in the lowering of the price. There are two facts which we would allude to in concluding these rambling observations. If cattle have hitherto been prohibited entering this country, how came the early breeders of our short horns to obtain cows from Holland, and upon which were grafted our finest strains of blood? And if butcher-meat of all kinds were prohibited until 1819, when the duty of salted beef was fixed at 12s. per cwt., how is it that so very little foreign meat has been imported since that period, not that the quantity has had the slightest effect upon our prices?

TABLES OF PRICES, &c.

The Average Prices of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets:—

LONDON.

Date.	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans.	
1842.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 4.	63	7	31	1	21	6	36	6	32	10	32	10
11.	60	8	30	8	22	0	37	2	33	6	32	7
18.	60	1	30	3	20	6	37	9	33	9	33	1
25.	61	7	30	9	20	6	36	4	33	4	30	1
March. 4.	62	5	29	8	19	1	34	2	32	6	31	4
11.	59	2	28	11	19	2	33	6	32	2	31	1
18.	59	7	27	6	19	2	34	4	31	8	29	2
25.	58	7	27	3	18	2	36	2	30	9	29	1
April. 1.	59	8	26	10	18	9	35	4	30	6	29	3
8.	56	9	26	5	19	1	34	2	29	8	29	2
15.	61	6	27	4	18	11	33	6	29	6	30	7
22.	61	5	27	11	19	9	32	8	30	2	30	7
29.	63	9	29	2	19	2	31	6	31	6	32	10

DUBLIN.

Date.	Wheat per Bar. 20 St.		Barley per Bar. 16 St.		Bear per Bar. 17 St.		Oats per Bar. 14 St.		Flour per Bar. 9 St.	
1842.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 4.	32	6	15	6	13	10	12	9	20	2
11.	28	6	15	4	14	4	10	9	21	8
18.	29	5	15	8	14	3	11	2	22	3
25.	27	8	15	7	14	4	10	9	21	6
March. 4.	28	7	15	8	14	2	10	8	21	6
11.	28	1	15	5	14	3	10	6	21	5½
18.	28	10	15	3	14	4	10	9	20	8
25.	29	8	15	9	14	6	10	10	20	9¼
1.	30	7	15	8	14	4	11	5	20	6¾
April 8.	30	9	15	6	14	6	11	6	20	8
15.	29	6	18	4	15	1	13	1	20	11
22.	28	4	19	0	15	4	13	3	21	1
29.	31	8	18	5	15	6	14	0	21	0½

LIVERPOOL.

Date.	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans.	
1842.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 4.	58	2	31	9	21	7	37	1	34	6	38	6
11.	58	1	35	7	20	10	37	6	35	4	36	10
18	59	3	33	5	21	10	37	4	36	4	36	2
25.	59	5	32	9	19	6	36	6	34	8	33	0
March. 4.	60	4	34	3	19	9	35	8	35	4	34	5
11.	58	8	31	4	20	6	34	9	37	6	40	7
18.	55	11	30	3	20	8	34	2	38	6	37	6
25.	56	7	30	6	19	10	33	4	36	2	32	10
April. 1.	58	2	31	0	19	6	32	8	34	8	36	0
8.	54	8	29	9	21	7	35	2	34	9	33	9
15.	55	6	27	6	19	10	34	6	36	10	37	3
22.	58	2	27	7	19	7	32	10	37	2	36	6
29.	56	4	27	1	19	4	32	6	35	9	35	10

EDINBURGH.

Date.	Wheat.		Barley.		Oats.		Pease.		Beans.	
1842.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 2.	61	6	29	9	24	3	34	2	34	0
9.	61	0	29	8	24	4	34	4	34	0
16.	62	0	30	0	24	6	33	6	33	8
23.	62	2	29	2	24	6	33	2	33	6
March. 2.	61	0	28	6	24	8	33	4	33	6
9.	60	0	28	6	23	4	34	8	35	6
16.	60	2	28	6	23	6	35	2	35	4
23.	60	6	29	6	24	0	35	0	35	4
30.	61	0	29	6	24	0	35	1	35	2
April. 6.	63	0	30	0	24	10	34	6	34	2
13.	63	6	29	6	25	0	34	3	34	0
20.	62	6	29	4	24	2	33	10	33	6
27.	62	8	29	2	23	4	33	2	33	0

TABLE shewing the Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. IV. c. 58, and the Aggregate Averages which regulate the Duties payable on FOREIGN CORN: the Duties payable thereon, from February 1842 to April 1842.

Date.	Wheat.						Barley.						Oats.						Rye.						Pease.						Beans.					
	Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.	
1842.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Feb. 4.	60	6	61	10	25	8	28	5	29	0	18	4	20	1	20	4	16	9	36	1	40	1	9	6	33	11	35	0	16	9	33	4	34	7	18	3
11.	60	0	61	4	25	8	28	2	28	9	19	10	20	4	20	3	16	9	36	0	38	10	12	6	33	9	34	5	18	3	32	9	34	0	18	3
18.	60	0	60	10	26	8	28	5	28	6	19	10	19	8	20	1	16	9	37	1	28	5	12	6	33	11	34	1	18	3	32	5	33	5	19	9
25.	60	10	60	7	26	8	28	6	28	5	19	10	19	8	20	0	16	9	31	10	36	11	15	6	33	[illegible]	33	9	19	9	31	10	32	11	21	3
Mar. 4.	60	9	60	5	26	8	28	3	28	4	19	10	19	1	19	10	18	3	34	3	35	2	16	9	32	6	33	7	19	9	32	0	32	7	21	3
11.	59	11	60	4	26	8	27	9	28	3	19	10	19	0	19	8	18	3	33	11	34	10	18	3	33	11	33	6	19	9	31	10	32	4	21	3
18.	59	9	60	2	26	8	27	0	28	0	19	10	19	1	19	6	18	3	36	4	34	11	18	3	31	3	33	1	19	9	30	8	31	11	22	9
25.	58	4	59	11	27	8	26	6	27	9	21	4	18	4	19	2	18	3	34	5	34	5	18	3	32	0	32	9	21	3	29	9	31	5	22	9
April 2.	57	8	59	6	27	8	26	2	27	4	21	4	17	11	18	10	19	9	32	11	33	9	19	9	30	0	32	2	21	3	30	0	31	0	22	9
8.	58	2	59	1	27	8	26	3	27	0	21	4	18	11	18	9	19	9	33	10	34	0	18	3	29	4	31	6	22	9	29	7	30	8	24	3
15.	59	10	58	11	28	8	26	11	26	9	22	10	19	2	18	9	19	9	32	6	33	10	19	9	30	5	31	2	22	9	30	11	30	6	24	3
22.	60	7	59	1	27	8	27	8	26	8	22	10	19	3	18	9	19	9	32	11	33	8	19	9	31	1	30	9	24	3	30	9	30	3	24	3
29.	61	0	59	3	13	0	27	7	26	9	10	0	19	1	18	9	8	0	31	7	32	10	10	6	32	1	30	10	10	6	31	6	30	5	10	6

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the Quantities of Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; the Quantities upon which duties have been paid for home-consumption, during the same Month; and the Quantities remaining in Warehouse at the close thereof, from 5th February 1842 to 5th April 1842.

Month ending	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN WAREHOUSE.		
	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.
Feb. 5. 1842.	Qrs. Bu	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, . .	67,658 3	10,772 4	78,430 7	435 4	4,843 3	5,278 7	276,118 2	13,524 6	289,643 0
Barley, . .	10,435 7	8 0	10,443 7	349 7	8 0	357 7	60,711 3	. .	60,711 3
Oats, . . .	1,210 5	6 0	1,216 5	16 7	6 0	22 7	93,342 3	. .	93,342 3
Rye, ...	6,444 6	. .	6,444 6	23,845 6	. .	845 6	458 0	. .	458 0
Pease, . . .	3,953 0	1,878 1	5,831 1	75 6	988 2	1,064 0	20,001 2	2,874 2	22,875 4
Beans, . .	11,975 5	. .	11,975 5	420 2	. .	420 2	39,284 2	. .	39,284 2
Totals,	101,678 2	12,664 5	114,342 7	25,144 0	5,840 5	30,989 5	489,915 4	16,399 0	506,314 4
Mar. 5. 1842.									
Wheat, . .	177,502 5	1,664 5	179,167 2	1,980 3	1,945 2	3,925 5	448,735 4	13,244 1	461,979 5
Barley, . .	8,901 3	. .	8,901 3	89 1	. .	89 1	69,513 7	. .	69,513 7
Oats, . . .	645 2	. .	645 2	. .	. .	. .	91,566 3	. .	91,566 3
Rye, ...	1,504 7	. .	1,504 7	184 0	. .	184 0	1,778 7	. .	1,778 7
Pease, . . .	3,285 6	128 4	3,414 2	55 2	239 3	294 5	23,129 7	2,762 5	25,892 4
Beans, . . .	5,099 5	. .	5,099 5	145 6	. .	145 6	44,253 0	. .	44,253 0
Totals,	196,939 4	1,793 1	198,732 5	2,454 4	2,184 5	4,639 1	678,977 4	16,006 6	694,984 2
April 5. 1842.									
Wheat, . .	212,396 2	71 2	212,467 4	1,855 2	1,171 6	3,027 0	658,771 5	12,134 5	670,915 2
Barley, . .	882 1	. .	882 1	. .	. .	0 6	70,758 6	. .	70,758 6
Oats, . . .	1,165 4	. .	1,165 4	64 6	. .	64 6	90,654 7	. .	90,654 7
Rye, ...	. .	. .	. .	156 0	. .	156 0	2,311 5	. .	2,311 5
Pease, . . .	276 2	. .	276 2	0 6	67 6	68 4	23,287 6	2,694 7	25,982 5
Beans, . .	8,063 5	. .	8,063 5	189 2	. .	189 2	51,907 3	. .	51,907 3
Totals,	222,783 6	71 2	222,855 0	2,266 0	1,239 4	3,506 2	897,692 0	14,829 4	912,530 4
Feb. 5. 1842.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
Flour, . . .	35,796 2 26	46,165 3 7	81,962 2 5	49 3 21	15,841 0 21	15,891 0 14	91,337 2 20	131,467 0 2	222,804 3 2
Oatmeal, .	. .	294 3 26	294 3 26	. .	655 0 11	655 0 11	20 1 26	803 2 20	824 0 1
Totals,	35,796 2 26	46,460 3 5	82,257 2 3	49 3 21	16,496 1 4	16,546 0 25	91,358 1 18	132,270 2 22	223,629 6 1
Mar. 5. 1842									
Flour, . . .	150,753 2 14	20,283 3 1	171,037 0 15	23 0 14	4,548 3 20	4,572 0 6	233,262 2 8	147,179 0 11	380,441 2 19
Oatmeal, .	. .	34 0 20	34 0 20	. .	346 1 26	346 1 26	20 1 26	669 3 16	690 1 14
Totals,	150,753 2 14	20,317 3 21	171,071 1 7	23 0 14	4,895 1 18	4,918 2 4	233,283 0 6	147,848 3 27	381,132 0
April 5. 1842.									
Flour, . . .	57,093 1 21	4,493 3 11	61,587 1 4	53 0 27	11,032 2 8	11,085 3 7	287,722 0 23	140,911 3 9	428,634 0 1
Oatmeal, .	1 20	464 2 21	465 0 13	. .	. .	. .	20 3 18	1,134 1 27	1,155 1 1
Totals,	57,093 3 13	4,958 2 4	[illegible] 1 17	53 0 27	11,032 2 8	11,085 3 7	287,743 0 13	142,046 1 5	419,789 1 1

PRICES of BUTCHER-MEAT.

	LONDON, *Per Stone of* 14 lb.		MORPETH, *Per Stone of* 14 lb.		EDINBURGH, *Per Stone of* 14 lb.		GLASGOW, *Per Stone of* 14 lb.	
Date.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
1842.								
Feb.	7/3 to 7/9	7/6 to 8/	7/ to 7/6	7/ to 7/6	6/6 to 7/3	6/3 to 6/9	6/6 to 7/3	6/3 to 7/3
Mar.	7/ 7/6	7/6 8/	7/3 7/9	7/6 8/	6/9 7/6	6/3 6/9	6/9 7/6	6/6 7/3
April	7/6 8/	7/3 7/9	7/3 7/9	7/3 7/9	7/ 7/9	6/6 7/3	6/9 7/9	6/9 7/6

PRICES of English and Scotch WOOL.

ENGLISH, per 14 lb.			SCOTCH, per 14 lb.		
Merino, ...	16/6 to	18/6	Leicester, Hogg, . .	14/6 to	17/6
in grease . . .	13/	15/	Ewe and Hogg, . .	13/	15/
South Down, . .	14/	16/	Cheviot, white, . . .	12/	14/
Half Bred, . . .	12/	14/	Laid, washed, . .	8/	10/6
Leicester, Hogg . .	16/	18/	unwashed, . .	6/3	8/
Ewe and Hogg, . .	13/	15/	Moor, white, . . .	6/	7/
Locks, . . .	6/	8/	Laid, washed, . . .	5/	6/
Moor, ...	6/	7/	unwashed . .	4/	5/

ABSTRACT of the Nett Produce of the Revenue of Great Britain, in the Quarters and Years ended on the 5th of April 1841, and 5th of April 1842,—shewing the Increase and Decrease on each head thereof.

	Quarters ended April 5.		Increase.	Decrease.	Years ended April 5.		Increase.	Decrease
	1841.	1842.			1841.	1842.		
	£	£	£	£	£	£	£	£
Customs, ...	4,515,508	4,495,053	. .	23,455	19,700,225	19,876,130	175,905	. .
Excise, ...	1,885,470	1,769,161	. .	116,309	12,530,036	12,464,609	. .	65,427
Stamps, ...	1,677,404	1,599,487	. .	77,917	6,755,118	6,631,529	. .	128,589
Taxes, ...	222,045	150,753	. .	71,292	3,989,431	4,411,619	422,188	. .
Post-Office, . .	93,000	142,000	49,000	. .	414,000	504,000	90,000	. .
Miscellaneous,	81,626	373,693	292,067	. .	250,062	537,805	301,743	. .
	8,475,063	8,530,147	341,067	289,073	43,638,872	44,439,692	989,836	194,016
	Deduct Decrease,		289,073		Deduct Decrease,		194,016	
	Increase on the Qr.		51,994		Increase on the Year,		795,820	

FIAR PRICES of the different COUNTIES of SCOTLAND, for Crop and Year 1841, by the Imperial Measure.

ABERDEENSHIRE.

	Imp. Qr.
Wheat, without fodder, .	
—— with fodder, . . .	
Barley, with fodder, . . .	27/
—————— with fodder .	36/
Bear, without fodder, . .	24/6
——— with fodder, . .	33/6
Oats, First, without fod. .	18/4
——— —— with fodder, .	29/4
—— Second, without fod.	17/
——————— with fodder,	28/
Pease, ...	28/3
Beans, ...	29/
Meal, 140 lb.	15/
Malt, ...	51/2

ARGYLE.

Bear, ...	26/8
Oats, ...	21/4
Beans, ...	31/4
Oatmeal, 140 lb.	17/5

AYR.

Wheat, ...	56/5¼
Barley, ...	29/8
Bear, ...	26/1¼
Oats, White, ...	17/8¼
Pease and Beans, ...	38/8¼
Oatmeal, 140 lb.	16/6½

BANFF.

Wheat, without fodder, .	56/6
Barley, without fodder, .	28/
——— with fodder, . .	35/
Bear, First, without fod. .	26/3
—————— with fodder, .	33/3
—— Second, without fod.	22/6
——————— with fodder,	29/6
Oats, Potato, without fod,	20/8
——————with fodder,	30/8
——Common, without fod.	17/9
——————— with fodder,	27/9
Pease, ...	33/
Beans, ...	35/
Oatmeal, 140 lb.	14/10

BERWICKSHIRE.

	Imp. Qr.
Wheat, ...	54/11¾
Barley, Merse, ...	27/7¾
——— Lammermuir, . .	23/3
Oats, Merse, ...	22/2¼
—— Lammermuir, . .	17/7½
Pease, ...	34/
Oatmeal, per 140 lb. . . .	16/8

BUTE.

Wheat, ...	56/10
Barley, ...	28/
Bear, ...	26/
Oats, ...	18/4
Pease, ...	36/
Beans, ...	36/
Oatmeal, 140 lb.	16/4¼

CAITHNESS.

Bear, ...	22/8¼
Oats, Early Angus, ...	17/10¼
—— Sandy, ...	17/10½
—— Dun, ...	16/8½
—— Potato, ...	19/8¾
—— Hopeton, ...	15/2
Oatmeal, per 140 lb. . . .	16/10½

CLACKMANNAN.

Wheat, ...	44/9½
Barley, Kerse, ...	28/7
——— Dryfield, ...	25/4
——— Muirland, ...	
Oats, Kerse, ...	19/7¼
—— Dryfield, ...	16/11¼
—— Black, ...	
Pease and Beans, ...	33/9¼
Malt, ...	51/7¼
Oatmeal, 140 lb.	17/2¼

DUMBARTONSHIRE.

Wheat, ...	56/8
Barley, ...	29/1
Bear, ...	25/4
Oats, ...	21/8
Pease and Beans, ...	39/6
Oatmeal, 140 lb.	17/6

DUMFRIES-SHIRE.

	Imp. Qr.
Wheat, ...	60/
Barley, ...	31/10
Bear, ...	30/
Oats, Common, ...	18/4
—— Potato, ...	20/6
Pease, ...	
Rye, ...	
Beans, ...	46/8
Malt, ...	63/
Oatmeal, per 140 lb. . . .	16/0½

EDINBURGH.

Wheat, First, ...	53/6
——— Second, ...	51/
Barley, First, ...	30/3
——— Second, ...	28/
——— Third, ...	27/
Oats, First, ...	21/2
—— Second, ...	19/
Pease and Beans, ...	33/6
Oatmeal, 112 lb.	14/
———— 280 lb.	35/

ELGIN & MORAY.

Wheat, ...	58/
Barley, ...	28/7½
Oats, ...	20/
Pease and Beans, ...	
Rye, ...	35/6
Oatmeal, 112 lb.	14/8

FIFE.

Wheat, White, ...	44/10½
———Red, ...	42/10½
Barley, ...	26/10½
Bear, ...	24/10½
Oats, ...	18/1½
Pease and Beans, ...	28/3½
Rye, ...	24/5½
Malt, ...	51/6½
Oatmeal, 280 lb.	32/1

FORFARSHIRE.

	Imp. Qr.
Wheat,	40/6
Barley,	23/3
Bear,	23/2
Oats, Potato,	17/10
—— Common,	17/11
Pease and Beans,	26/5
Rye,	24/10
Oatmeal, 140 lb.	15/9

HADDINGTON.

Wheat, First,	67/10¾
—— Second,	62/6
—— Third,	56/7
Barley, First,	36/1¼
—— Second,	33/2¾
—— Third,	30/0¾
Oats, First,	25/10½
—— Second,	24/5¾
—— Third,	22/9½
Pease and Beans, First,	
—— Second,	
—— Third.	

INVERNESS.

Wheat,	57/
Barley,	28/4
Bear, without fodder,	
—— with fodder,	
Oats, Pot. & Hop,	20/3
—— Common,	20/3
Oatmeal, 112 lb.	18/9

KINCARDINE.

Wheat, without fodder,	38/10
—— with fodder,	48/10
Barley, without fodder,	24/
—— with fodder,	31/6
Bear, without fodder,	21/5
—— with fodder,	28/11
Oats, White, without fod.	17/2¾
—— with fodder.	26/2¾
—— Potato, without fod.	16/10
—— with fodder,	25/10
Pease & Beans, without fod.	26/5
—— with fod.	37/5
Oatmeal, 140 lb.	15/2½

KINROSS.

Wheat,	37/
Barley, First,	26/3
—— Second,	23/3
Bear, First.	20/3
—— Second,	
Oats, White, First,	16/7
—— Second,	14/7
—— Black,	11/10
Pease and Beans,	25/
Oatmeal, 280 lb.	30/10

KIRKCUDBRIGHT.

Wheat,	56/
Barley,	31/4
Bear,	
Oats, Pot. and Hop.	18/8
—— Common.	17/8
Rye,	32/
Oatmeal, per 140 lb.	15/2½

LANARKSHIRE

	Imp. Qr.
Wheat, First,	56/5½
—— Second,	50/2
—— Third,	42/2
Barley, First,	30/8
—— Second,	27/4
—— Third,	20/
Bear, First,	27/
—— Second,	22/8
Oats, First,	23/
—— Second,	20/4
—— Third,	16/4
Pease, First,	42/
—— Second,	36/
Beans, First,	38/6
—— Second,	38/
Malt, First,	56/
—— Second,	49/4
Oatmeal, First, 140 lb.	17/4
—— Second,	15/6

ARCHBISHOPRIC OF GLASGOW.

Barley,	
Oats,	
Malt, per Boll,	
Meal, 140 lb.	

LINLITHGOW.

Wheat,	47/5
Barley,	29/4
Oats,	20/
Pease,	32/4
Malt,	50/
Oatmeal, 140 lb.	16/2

NAIRN.

Wheat,	58/6
Barley, without fodder,	28/
—— with fodder,	34/
Oats, without fodder,	19/
—— with fodder,	32/
Oatmeal, 112 lb.	14/

ORKNEY.

Bear,	14/7
Malt, 140 lb.	15/4
Oatmeal, 140 lb.	18/

PEEBLES.

Wheat, First,	52/6
—— Second,	47/3
—— Third,	42/8¾
Barley, First,	30/1½
—— Second,	27/8
—— Third,	24/11¾
Oats, First,	20/10¾
—— Second,	18/5½
—— Third,	15/5
Pease, First,	41/5½
—— Second,	32/8
—— Third,	28/
Oatmeal, First, 140 lb.	16/7½
—— Second,	16/2½
—— Third,	15/10½

PERTH.

Wheat, First,	53/
—— Second,	40/7
Barley, First,	26/10
—— Second,	21/3
Oats, First,	17/11½
—— Second,	14/3
Pease,	28/
Oatmeal, 140 lb.	15/6

RENFREWSHIRE.

	Imp. Qr.
Wheat, First,	56/7¾
—— Second,	54/7½
Barley, First,	30/2
—— Second,	28/10½
Bear, First,	26/10¾
—— Second,	24/8¼
Oats, First,	21/9¾
—— Second,	20/6
Beans, First,	39/
—— Second,	33/2½
Oatmeal, 140 lb.	17/1

ROSS AND CROMARTY.

Wheat,	46/9½
Barley,	29/
Bear,	
Oats, Pot,	22/9¾
—— Common,	22/0½
Pease,	
Oatmeal, 140 lb.	16/3

ROXBURGH.

Wheat,	60/5½
Barley,	28/8
Oats,	22/0½
Rye,	
Pease,	37/10¾
Beans,	36/2¾
Oatmeal, 140 lb.	17/1

SELKIRK.

Wheat,	60/
Barley,	26/8
Oats, Potato,	19/3
—— Common,	17/4
Pease,	31/
Oatmeal, 280 lb.	33/1

STIRLING.

Wheat,	42/
Barley, Kerse,	29/9¾
—— Dryfield,	28/10½
Oats, Kerse,	20/8
—— Dryfield,	20/
—— Muirland,	
Pease and Beans,	34/
Malt,	53/4
Oatmeal, 140 lb.	16/4

SUTHERLAND.

Wheat,	
Barley,	26/
Bear,	23/5
Oats, Potato,	22/
—— Common,	20/
Pease,	
Rye,	
Oatmeal, 140 lb.	18/

WIGTON.

Wheat,	49/10
Barley,	30/6
Bear,	23/10
Oats, Potato,	17/6
—— Common,	16/
Malt,	61/4
Rye,	
Pease and Beans,	
Oatmeal, 280 lb.	30/9

We may inform our English readers, that Fiar Prices are the average prices of grain, as ascertained every year by the verdict of Juries in every county of Scotland. These Juries are summoned in spring, and ascertain, from the evidence produced to them, the average prices of the preceding crop. By these prices, rents payable in grain, and similar contracts, are generally determined; but the main object is to convert into money the stipends (for the most part fixed at a certain quantity of grain) of the Scottish Clergy.

THE
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THE WORKS OF ARTHUR YOUNG.

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THE close of the last century and the commencement of the present, were marked by considerable advances in the science of agriculture. To this very desirable march of improvement many causes contributed. Great political efforts and convulsions had rapidly raised very considerably the value of the cultivator's produce,—the attention of many capitalists, endowed with vigour of mind and full of enterprize, was in consequence directed to the considerable profits to be acquired by farming, while such high prices continued. The king, too, the excellent George III., delighted in agricultural pursuits, and his good example was followed by many of his richest an most enlightened nobles. Several authors upon husbandry also now appeared, and tended to increase the general popularity of the science, by the spirit they displayed in the collection and arrangement of agricultural discoveries, and by the plain easily understood nature of their works. The chief of all these distinguished writers was Arthur Young, who certainly was the most voluminous, the most enthusiastic, and the most popular author upon rural affairs who had yet appeared in England. And perhaps it would only be in accordance with truth to assert, that no other country ever produced a writer whose works upon agriculture were so long and so universally popular. Young, in early life, entered into the profession of a farmer with all the confidence of youth, and all the fervour of a proselyte, for he was not originally intended for agricultural pursuits, but was in truth at first a clerk in the office of a merchant in a country town.

His life has been sketched partly by himself, and also by his friend and medical attendant Dr Paris (*Brande's Journal of Science*, vol. ix. p. 279), and to these I am indebted for most of the dates with regard to the subject of this essay, who was the son of the Reverend Arthur Young, and born in London, September 7. 1741,—the year in which, according to some authorities, Jethro Tull, whose indefatigable spirit and talents he seemed to inherit, died. Educated at Lavenham School, and being intended for mercantile pursuits, he was placed in 1758, with the Messrs Robertson, merchants of Lynn in Norfolk, where he betrayed but little taste for commerce, and where he wrote his earliest work, a political pamphlet, on the first American War, and this was speedily followed by four or five novels.

It was in 1763, however, when only twenty-two years of age, that, abandoning commercial pursuits, he commenced on the patrimonial estate of his family at Bradfield Hall, in Suffolk, the life of a farmer. His early agricultural efforts, however, were a series of failures. " Young, eager, and totally ignorant, as he then was, of every necessary detail," says Dr Paris, " it is not surprising, as he afterwards acknowledged, that he should have squandered large sums, under golden dreams of improvements, especially as he connected with these a thirst for experiment without a knowledge of what is demanded for its success, or what were the fallacies to which it was exposed in the execution." In the following year appeared, in a periodical work, the " Museum Rusticum," the first of his agricultural writings. These he afterwards reprinted as an appendix to his " Farmer's Letters." In 1767 he undertook the management of a farm at Samford Rivers, in Essex, which, from a want of capital, he soon relinquished. After this he spent some time in searching for another farm, and in so doing gradually collected materials for his next agricultural work, "The Six Weeks' Tour through the Southern Counties."

Arthur Young was, however, still unfortunate in his farming attempts. He hired, by the advice of his Suffolk bailiff, a farm of 100 acres in Hertfordshire, which, from being seen by them in a very favourable season, deceived them both. "I know not," said Young, when describing it some years afterwards, "what epithet to give this soil; sterility falls short of the idea, a hungry vitriolic gravel. I occupied for nine years the jaws of a wolf. A nabob's fortune would sink in the attempt to raise upon it good arable crops. My experience and knowledge had increased from travelling and from practice, but all was lost when exerted upon such a spot. I hardly wonder at a losing account, after fate had fixed me upon land calculated to swallow without return, all that folly or imprudence could bestow upon it."

He next published, in 1770, his "Rural Economy," and in 1771, his "Farmer's Calendar," perhaps the best known of all his works. In 1784, for it is needless to follow him through all his "Tours,"—Pamphlets (a list of which I shall presently give), and other public efforts, he commenced the publication of his "Annals of Agriculture,"—the most important periodical or other work on agriculture that had yet appeared. It was printed in occasional numbers, at Bury St Edmonds, and extends to forty-five volumes octavo. In this excellent periodical, Young, with few exceptions, admitted only the contributions of those who had the courage to sign their names to their letters. "My intention is," he told his readers in his preface, "to publish a number, as often as my own experiments and the communications I am favoured with will permit,—the bulk of the pamphlet will be various and the price proportionate." His first paper, of the first number, was long and rambling, contained an abundance of political observations, but little with regard to agriculture. Arthur Young, in fact, possessed keen political feelings, and these he was much too ready on all occasions to attempt to enforce in his Annals; and as a natural consequence, he was merely the patriot of a party. This he soon found out, for, at p. 119 of vol. i., he says, "I may print Annals of Agriculture, publish them in due form, and advertise them as I please, but the attention of the people is too much turned to the brawls of personal politics at St Stephens, to leave a moment for attending to a subject of so little concern as husbandry."

At p. 139 of this volume he commences a series of essays, which contain a very copious account of a variety of experiments upon manures and the food of plants, and these are dispersed through several of the earlier volumes. The first paper of this series is entitled "Experiments to ascertain how far, and in what form, phlogiston is the food of plants." It may be well perhaps to remind the modern farmer, that phlogiston was an imaginary substance, supposed by the chemists of that day to be almost universally present. Its description more nearly resembled hydrogen than any other substance with which we are acquainted. The volume contains communications from many valuable contributors, such as Dr Fordyce, the Duke of Northumberland, Dr Symons, and many other distinguished men of that day.

At p. 301, vol. ii., Young again launches out on the ocean of politics, with an energetic essay, entitled "Observations on the window-tax, as a commutation for the duty on tea." In this now long-established and peaceably collected tax, he saw nothing but ruin and confusion to the country gentlemen of England, who, he predicted, would be "crushed by this new impost; his land being already taxed to king, church, and poor; his house, his windows, his horses, his servants, his sports, not to touch upon every article of his consumption in common with every other class; their estates torn from their ancient possessors, will be transferred to the nabobs and plunderers of the age." But to whom, he exclaims at p. 383, "Are we to look for a change decisive to the happiness of mankind? To Government? As well might the bleeding lamb look for mercy to the relentless wolf." When, however, Young could forget the politics of the day, and the morbid excitement of party strife, he expressed himself with an energy, an enthusiasm, and a healthiness of tone, which was entirely English. Thus, at p. 456, vol. i., he has a paper on the pleasures of agriculture, which could not fail to produce its effect upon the landowners of his day. He sets out with a quotation from Cowley. "We may talk what we please of lilies and lions rampant, and spread eagles in fields d'or or d'argent, but if heraldry were guided by reason, a plough in a field-arable would be the most noble and ancient arms." The gallantry, too, of Young, peeped out on all occasions; he was ever ready and delighted to elevate and defend the softer sex. Having examined agriculture, he remarks,—"As a pursuit of life under these principal heads, I cannot but add an observation on its merit in harmonizing with the views of a family. Most other pursuits that strongly attract the mind, exclude a woman from all participation, and are, for that reason, if for no other, perfectly good for nothing; but many of them do more than exclude. they not only prevent her from associating in the amusements of her husband, they abridge or prevent those that are properly her own. It is probably owing, in some degree to this, that we see many sensible men without any pursuit whatever, whose life passes in a very even tenor of harmless insipidity. Each day brings its breakfast, its dinner, its coffee, and supper; if company comes in, there is a little more eating, a little more drinking, and a rubber or two extraordinary; the servants are orderly, the liveries new, the horses sleek, the equipage clean, and an airing wholesome, so many times a-week the news or a coffee-house; and as the order of things demands six or seven hours between breakfast and dinner; a morning call or two is among the *agrémens* of the day. The lady of the house partakes of every one of these circumstances, and may certainly find them much more to her mind than three-fourths of the pursuits common amongst men; yet is there not an atom difference, unless she is handsome, between the life of her husband and the vegetation of an oak."

There was a very noticeable air of sincere uncompromising candour, on the part of Young, whenever he was discontented with his brother farmers, especially if he considered his own exertions in their behalf neglected, which sometimes bordered on the ludicrous. For instance, at the end of the first volume of the Annals, finding that he had lost by the work L.11 : 18 : 3, "besides advertisements," he states the account with much angry simplicity, and (evidently believing that the remonstrance would be attended with good results) informed his readers,—"If I was to indulge my own feelings only, I would drop the work, and forswear ever taking a pen in hand again, on a subject evidently of no importance in the opinion of the public. I have received," he continues, "intelligence from only ten counties in fifty-two, besides all Scotland and Ireland. The extent of the correspondence is therefore small. What are the means which country gentlemen and resident farming rectors take to be of use to the public? Did they receive an education from their parents, in order to eat, drink, sleep, live, die, and rot in oblivion? The horse in their stable can do all this. Do they conceive that to plough, to sow, to reap, to thrash, and to get money, ought to be the objects of their agriculture? The stupidest clown that scratches his head at a vestry can do this. What comparison is there at present between Gabriel Plattes, starved in an age that doubtless patronized, and pensioned its pimps, puppies, and buffoons, and those scores of country gentlemen with their L.5000 and their L.10,000 a-year, to discover whose existence, we must, half buried in dust, kick aside the bundles of cobwebs and parchments, to come at the only record of their actions, their mortgages, or their wills?" But still he would not yet give up the magazine. "I will," he adds, "give it the farther trial of another volume, and then, if I find the same indifference to the cause which I have hitherto experienced, I will leave the subject to some abler editor." At p. 250 of volume iv., he again renews the statement of profit and loss, but with evidently a subdued tone, for the sale had risen to 500 copies, and, besides, his publisher very reasonably "complained of these public statements of the profit and loss of a magazine, as being quite novel in the trade."

And these reproaches were not confined only to the annals of agriculture. He shewed, on all occasions, a considerable state of irritation whenever his remarks seemed to be disregarded. Thus, in his introduction to his "Six Weeks' Tour in the Southern Counties," he remarks,—"They who suppose any improvement originally owing to common farmers, are somewhat mistaken. All the well known capital strokes of husbandry are traced accurately to gentlemen: From whence comes the introduction of turnips in England but to Tull? Who introduced clover but Sir Richard Weston? Marling in Norfolk is owing to Lord Townsend and Mr Allan. In a word, the most noted improvements were devised and first practised by gentlemen. Common husbandmen, in a long period of years, imitate the method in proportion to the success, and so, by slow degrees, it becomes general. So I could not be understood to expect too much from the common farmers reading this, or, indeed, any book; I am sensible that not one farmer in five thousand reads at all, but the country abounds in gentleman farmers, whose ideas are more enlarged, and whose practice is founded less on prejudice, such cultivators may be supposed to read and act accordingly; it is by their means that the farmers vary by slow degrees, the common line of management, and come into improvements unknown to their forefathers." Young laboured hard to render his tours not only instructive but amusing, and he pretty well succeeded in his endeavours,—for, in his travels to different places, he leads his readers to every place of public resort, which the even mere seeker for amusement would be likely to visit.

To return, however, to the Annals of Agriculture. At p. 515, vol. v., Young continues the detail of the researches carried on in 1785 "on the food of plants." This important investigation did him the highest credit, for with only a very slight knowledge of chemistry, and with few to encourage him in the pursuit, he yet carried on a mass of experiments, which, full of instruction with regard to the effect of manures, will ever redound to his honour. The modern accomplished farmer, however, must not forget, when he is reading these essays of Young, that if he did sometimes try chemical experiments which could not be attended with advantage, that this was owing to the limited progress which chemistry had then made; "science with practice" had not then, as now, become the motto of our island's best farmers. Young spoke like, and with the modesty of, a man of genius, when he said, in the first sentence of this essay (and let us remember that this was written 57 years since), —"The more any person reflects with attention on the surprising deficiency of well ascertained facts on which to found a consistent theory of vegetation, the more necessary will certainly appear the multiplication of those experiments which can alone lay the adequate foundation. The more I attend to the result of the trials I have made on the present small scale (and such experiments are utterly impossible on any other), the more I am convinced that this is a field in which very considerable discoveries might be made, provided the enquiry is prosecuted with a close and unremitted attention. What is within the power of my weak and insufficient process, I shall not neglect, but I much wish I had some fellow-labourer in this vineyard, who would bestow the expense, time, and attention that are necessary to the spirited examination of so interesting a subject." He thus sums up the detail of his laborious investigations. "Some business, and an attention diverted to other objects, have prevented my increasing these trials this year. But the period has not been entirely barren. The volatile alkali (ammonia) continues to support the high character I had reason, from former trials, to give of it, and common salt proves, when properly applied, a very valuable manure. The effect of applying enriching manures after those that act mechanically is strongly illustrated. All these facts bear immediately on common practice, as will easily be conceived by those who have given a proper attention to the subject; of others, by no means to be neglected, I say nothing, they must be repeated and varied. Time may render them more interesting than they appear at present."

Young would, in our age, have been a warm advocate of experimental farms. Experiments of all kinds were seemingly ever his delight; and at p. 17 of vol. v. he has an elaborate paper "On the conduct of experiments in agriculture."

"The great progress," he observes, "which natural philosophy has lately made, and is at present making, in every part of Europe, has been owing almost entirely to the conviction with which every rational mind is impressed of making experiments the road to truth. Theory and hypothesis, which so long possessed an undue empire in the human mind, are at last dispossessed from their usurpation, and nature, brought by philosophers patiently and steadily to the test of experiment, discloses her secrets to those whose industry deserves her confidence. The progress of fact depends greatly on the nature of the science. In most of the branches of philosophy there are no insurmountable difficulties in ascertaining it. When former experiments are doubted, they may be repeated without any very formidable waste of time or expense. In this case the labours of one generation are appropriated by the next, and the successive age, in possession of all preceding knowledge, advances with an accelerated rapidity. How amusing is the history of chemistry, to trace the discoveries from the alchemists to the present day! In pneumatic chemistry, for instance, we may be satisfied that Boyle prepared the way for Hales and Stahl, and that without these it is not probable that Black would have made the great advance which he effected, which opened the way for Priestley and other great modern chemists. The rapid progress of so many sciences furnishes us, by comparison, with the true reason why that of agriculture has been so slow. No experiment in that science is to be made in less than six months, few in less than a year, and many demand three, four, and even six years to complete. The expense also, on a large scale (and many objects can be ascertained only on a large one), is very great. Nor are time and money all that are wanted. The process is in the hands of clowns, and what is often much worse, of ill-educated conceited bailiffs, who find either pleasure or profit in a miscarriage. A man with a fortune requisite, will not twice in an age give the residence or the attention necessary for ascertaining facts. Nor does the evil rest here; experiments are in the open fields, and consequently liable to the plundering of thieves, and to many other sources of error. And, again, every experiment is in a great measure dependent upon the weather; if the summer turns out very wet, the result will not be the same as if it is dry, and the dry season may come when the wet one is wanted for the trial. When all these circumstances are considered, it will clearly appear that trials in agriculture are quite another thing from those in any other science. Experiments in a laboratory, which a man can lock up when he turns his back, upon a substance that lies on a table or is confined in a jar, with machines to be trusted in no hands but his own, in such a situation all is within command, and though difficulties will arise (for what pursuit is free from them?), yet they are such as will depend very much on his own talents, skill, and industry to remove, perfectly free from the interruptions of storms, thieves, birds, game, &c. The contrast is so strong, that it accounts readily for the extreme backwardness of this art, and from its not being removed from its old doubt and confusion by the labours of an age that has impelled every other science in a most rapid course."

In his volume vi., p. 266, he gives a detail of a long course of experiments which he had made "upon the air expelled from earths," which betrays at once his zeal for knowledge, his industry, and his love of truth. He evidently made all his experiments without any preconceived theory; and as he generalized very readily, almost without an effort, so he abandoned them with much facility. "The theory," he remarks, p. 323, "which I have deduced, forced itself upon me; and should a greater variety of experiments turn out different, I shall be as ready to abandon as to frame it." And at p. 465 he gives a very interesting account of the journey which he paid to Dishley, the farm of the celebrated grazier Robert Bakewell. Young knew the value of Bakewell's labours to agriculture, and he omitted no opportunity to support him in the best way in his power. In this paper, after giving a long and animated description of what Bakewell had done for the grazier and the farmer, he truly enough told the farmers of that day, that in such researches the interests of the community "is greatly and intimately concerned. It is not a question of this or that breed of cattle or of sheep, but of that knowledge and sagacity that shall, in a manner superior to all other men, carry any particular breed to the highest pitch of perfection. The man that has shewn experimentally the talents adequate to this truly national pursuit is a public man, and ought to be supported by every exertion that can give animation to the efforts of individuals."

Two years had now elapsed since the first publication of the Annals of Agriculture, and it had already engaged the support of the leading farmers of England; but it was never supported by the public at large to the extent which its merits deserved. In the 1st page of vol. vii. the Duke of Grafton became a correspondent; and at p. 65, under an assumed name, is a description "of Mr Duckett's mode of cultivation by Mr Ralf Robinson of Windsor." This modest detail was written by George III., who loved and patronized farming on all occasions, with his usual good sense. It is dated January 1. 1787, and in its opening sentences the King told Arthur Young,—"It is reasonable to expect that your laudable efforts for the improvement of husbandry, by publishing the Annals of Agriculture, must in time be crowned with success; therefore it seems incumbent on all who think they have materials on this interesting subject, worthy of the inspection of the public, to transmit them to you, who, if you view them in that light, will give them a place in that estimable work." The King then proceeds with a detail of the practice of Mr Duckett on his Petersham Farm, near Windsor, to whom this good king often paid a visit, to the great delight of its owner, who used to say that his Majesty's attention to his farm "was as dew upon the grass." The King again addressed Arthur Young, under the same signature, at p. 332 of the same volume.

At p. 217, Young reviews the detail of his experimental researches, on expelling air from soils, which, although conducted like most of his philosophical researches, without the elegance and the accuracy of modern chemists, yet were not without their advantages to agriculture; and he correctly enough observed, in conclusion, "to those who have a just idea of scientific principles, raised on the only solid and undeceiving basis, experiment, these papers, uninteresting as they must appear to the uninformed part of my readers, will be esteemed as preparations carefully making for future theory, system, and practice;" and in support of this observation he quotes an observation of Bergman, the great northern chemist. "In natural philosophy, no observations are trivial, no truths insignificant; that which to us is barren, is often so for this reason only, that we do not sufficiently know nor sufficiently examine it."

An account of the tour which Young made in Catalonia is given at p. 192 of vol. vii., and betrays, as the details of all his tours did, a great thirst for knowledge and an activity of mind which no difficulties could deter. There is a very interesting paper in volume ix., p. 105, by Lord Fife, upon the mode he adopted in his noble Scotch plantations, which modern owners of extensive tracts of poor land might peruse with considerable advantage. He says,—"My great inducement to promote extensive plantations was to aid agriculture and manufactures, and to ornament and beautify the country. It is now about thirty years since my plantations commenced, and from their infancy to the present time I have nursed them with care, regularity, and perseverance; every year has enlarged the old and given birth to a new planted enclosure: by these means, about 7000 acres of bleak and barren moor have been clothed with thriving and flourishing trees in the counties of Aberdeen, Banff, and Moray."

Whatever might be Arthur Young's zeal in controversy, (and political contests and calculations were ever seemingly his delight), he generally avoided personal attacks, or any observations likely to annoy his opponents. His remarks, vol. x., p. 560, on the sheep controversy between Bakewell of Dishley (the only one, it is supposed, that this great farmer ever was engaged in) and Chaplin of Tathwell, were dictated by this feeling. "I should have been better pleased with them," he remarked, "if they had been free from heat and asperity. Controversialists are very apt to run into personalities, but nothing is more foolish. The world, taken in general, is ever well pleased with it; but the world is as mischievous an animal as a boy who sets two dogs together by the ears, and when they have well worried one another, throws stones at them both. When men of talents differ in opinion on such a question as the present, their first great object should be, to propose such measures as should ascertain in the most unequivocal manner which is really the best breed, on what soils, with what food, and under what management: taunt, and raillery, and reflections, will do nothing towards this."

Towards the conclusion of volume x., it is evident that the sale of the Annals of Agriculture had seriously declined. Young again addressed the landed interest upon their apathy in a way that was hardly likely to engage their sympathy. Again he gave a statement of the profit and loss of vol. ix., by which it appears he incurred a debt of L.71 : 6 : 6. —"In such a situation," he said rather despondingly, "the sale is obviously short of what is necessary to place me even in a state of security. The conducting of such a journal, to which I have given no slight attention and contributed largely, demanded at least an exemption from any addition of fresh anxieties to the decline of a life chequered with disappointment and infelicity. I had hopes that the landed and farming interests of the kingdom might have had ideas liberal enough for the support of such a work, and that the expense of a few shillings, or a guinea a-year, would not have been a material burthen for keeping open a repository, the mere existence of which is itself valuable. If a discovery is made, or any useful practice noted, these Annals are open for their reception, where they may be preserved for the benefit of posterity. The merit of such a plan is not to be measured merely by the contents of the month. It is a channel for the concentration of floating and desultory knowledge, and the reader has every probability, while such a work is regularly published, of having some intimation in it of whatever improvements distinguish the agriculture of the age. I will continue it to the last moment that any idea of prudence will allow. Though the termination of a work, which I wished might prove perpetual, would add to my mortification, its continuance will add nothing to my profit, or I had not entered into this explanation with the public." He gave at the end of this volume, and of the twentieth, thirtieth, and fortieth, a general index of the contents of the preceding ten volumes; a plan which the proprietors of modern periodicals might advantageously follow.

There are many curious papers dispersed throughout "the Annals" not strictly agricultural, which are at least full of amusing matter. For instance, at p. 521 of vol. xii., there is an account of the "Improvements in agriculture and manufactures made in Ireland in the former part of the last century, by Sir C. Wandesforde, Bart. (created Lord Viscount Castle Comer), Lord Deputy of that kingdom." By this it appears that the princely estate of Castle Comer (20,000 acres) was purchased of the Brennans by this nobleman in 1637 for only L.20,000. It gives a curious account of the state of Irish agriculture two centuries since.

In 1795, five years after the publication of the first number of "the Annals," Young was attacked by a serious illness, on the recovery from which, he addressed his readers in a long and interesting paper, without a title, and merely superscribed "by the Editor," in which he sketches the first and most active portion of his own life with much good feeling, yet with the only partially subdued anger of a man who felt that he had long served the dearest and best interests of his country with an energy and zeal that had not yet been even imperfectly requited, however generally they might be acknowledged. "It has pleased God," he told his readers, vol. xv., p. 152, "to raise me to a state of convalescence from the severest illness, and which, happening at the worst season of the year, will leave me for a long time feeble in body, and I fear in mind also. Such a shock to the constitution at my time of life forms an awful pause in a man's existence; it breaks the thread of his pursuits, interrupts the chain of his prevalent ideas, directs his reflection into new channels, and turns his attention more *within* to his own state and situation. Few men care publicly to enter into any detail about themselves, when it must be accompanied with confessions of their follies, of their errors, or of their vices; they are probably very prudent in it, and, for what I know, such as venture to do it, depend upon more candour in the world than it contains, or at least than it is willing to apply. I have gone too far now not to go further. I must do it in a review of my last thirty years. It shall be a rapid one, for to tire the reader with minutiæ, when the author and his subject at the best deserve no other appellation, would be necessarily to disgust him; and this ought to be the more sedulously avoided in a paper which I am obliged to crowd with egotisms, till I feel myself tired with repeating them.' He then describes events in his life to which I have already more briefly alluded.—"About thirty years ago, I began my farming upon the lands which I occupy at present; I had about 300 acres hired of my mother. Young, eager, and totally ignorant, trusting to a bailiff, who I conceive now merited no confidence either for honesty or skill, it was not surprising that I squandered much money under golden dreams of improvements, especially as I conceived a thirst for experiment without the knowledge of what an experiment demands, and which a series of proofs alone can give. In a few years a declining purse, with some domestic disputes from a mixture of families, and the prudent caution of one of the best of mothers, to whose memory my heart would be dead were it not to beat with more than grateful remembrance, altogether induced me to remove from Bradfield. I hired Sampford Hall, in Essex, a noble farm of 300 acres, including a range of meadows sufficient for 40 or 50 cows. A relation was to lend me money enough to make my capital sufficient; but he was himself disappointed in money matters within a few months after. I immediately foresaw that I should be utterly incapable of carrying on so large a business; the first loss was evidently the best. Mr Portway, who took it of me, has since made a fortune in it."—He then, after describing the unfortunate speculation of the Hertfordshire farm, proceeds to describe the publication of his "Six Weeks' Tour" and other works, of which he remarks,—"In this period I made and published my other Tours, and other works of much inferior merit, which I was tempted to do from the success that my former had met with; and perhaps no author ever experienced more strongly than I did the effects of writing and publishing a great deal too much and too fast; for I did everything possible to write myself down, and indeed effected it in a great measure, as far as a bookseller's ideas are annexed to that term."

"The tranquil bosom of my good mother's hermitage, my native Bradfield, once more opened its arms to receive us. It was little more than to come to close the eye and receive the last sighs of that beloved parent. Blessed spirit! may my hitherto restless days finish as thine did! who didst meet death with the tranquillity of healthy life, and mightest have said with as much justice as an Addison, see with what peace a Christian can die! Upon her death, this patch of landed property devolved to me, by a previous agreement with my elder brother, and by my mother's will. The following Michaelmas after my arrival, I took the home farm into my hands, the lease of which was expired, meaning gradually, as the leases allowed, to form a farm and to adhere to the culture of it; their dropping in that manner suited my weak means of stocking, which, after all, I should not have been able to effect, but for the assistance which I derived from the death of two sisters of my mother, one of whom had most kindly not forgotten me in her will; what I gained from the other was by a decision in Chancery. At this period of beginning with my little farm, I date one great error and oversight of my life, which I feel now, and shall continue heavily to feel as long as I live. It was an error the more unpardonable, as I was advanced in life, and had not the heat and inconsiderateness of youth to plead. I ought then to have calculated, and ascertained from my income, the utter impossibility, consistently with ease and tranquillity, of living like a gentleman. I do not mean with the equipage, attendance, and show of one, for such I never dreamt of; but the society, the habits of life, the ideas, the arrangements of the family, and a thousand points of expense which would have vanished on such a change. Had I strenuously and vigorously sunk into the mere common farmer, myself and the family would certainly have lost some pleasure and some enjoyments; but we should have gained what are much better, tranquillity and freedom from anxiety. I missed the opportunity of sinking to advantage, and it occurred no more; acquaintance and friends gradually came in, and I found myself by degrees in a society of men who loved farming as I did, and the pleasure of their conversation would have made such a scheme (had I thought seriously of it) every day more difficult. I lived, however, for a few years in great retirement, and at a small expense; and not the less easy, because the pen was not in my hand."

"The last circumstance fate would not permit to last long. I have always been much too apt to think myself idle and useless, if I had not some employment for which mankind, or at least some classes of it, might be the better. In my station of life, such ideas are compounded of vanity and imprudence; they belong to the rich, who can execute effectually what they wish. My fermenting mind produced the plan of these Annals, which were first published in January 1784. They seemed the signal for fresh bustle and activity, new currents, and new gusts of those winds which had blown me about so long. Printing first too many, then too few, and reprinting, and reprinting again, and again still fewer, at a dead expense, and no return; misunderstandings with the printer and publisher; the work moved to another; he breaking L.350 in my debt; moved again; new faces, new anxieties. Such has been the history of a work greatly praised, but not bought, and the editor receiving commendation and compliments from all parts of Europe, with L.1500 worth of the numbers lying dead in his warehouse. But still I have not lost by it, and therefore it has been continued."—"It has," he truly adds, "been nobly supported by a correspondence that would have done honour to any book; and should it continue, it will convey to posterity so vast a magazine of information, and truly useful experiments, that it is impossible it should fail to be of eminent utility to the progressive improvement of the agriculture of these kingdoms."

Young experienced all the difficulties which commonly beset those who write their own biographies. He was too prosy, too fond of dwelling upon trifling incidents, and too ready to complain of fancied neglects and imaginary instances of ingratitude. After describing his tour in France with M. Lazowski, and the Count de Rochefoucauld—his return—his public opposition to a proposed wool-bill—he proceeds:—"When this folly ended, another recommenced. I set out on my second journey to France. I made this alone, my cloak-bag behind me; and I did not travel thus an hundred miles before my mare fell blind. I have heard and read much of the pleasure of travelling; how it may be posting with avant courier, preparing apartments and repasts, I know not; let those who enjoy such comforts pity me, who made 1700 miles on a blind mare, and brought her (humanity would not allow me to sell her) safe back to Bradfield."—Young was ever ready to complain of and upbraid a public, from whom it was his delight to receive plaudits. Thus he told his readers, towards the conclusion of his sketch—"And here ends my narrative of thirty years. I know not what epithet to give them generally; but they have been a series of never-ceasing labours and never-failing anxiety. I may say it with confidence, because I say it with truth, that during that period I have hardly known what an idle hour has been. I have worked more like a coal-porter (though without his reward), than a man only acting from a predominant impulse. And for what all this restless activity—this eternal struggle? To serve the public (I am sure I have failed dreadfully if it was to serve myself)—a public that, if I was in the dungeon of a prison, would leave me to rot there."—He could not leave the public, however, entirely out of humour with it.—"I sought, however," he says, "to do something that might give my country a better interest in me, than if the whole register of my life had been contained in the few words, that I ate, drank, slept, and passed to oblivion. And I shall farther add, lest the reader should be tempted to extend my imprudence to a greater length than fact would justify, that of this little freehold, derived from happier ancestors, and over which I have an unlimited power, I never sold an acre, nor mortgaged it, except in the single instance I have mentioned, for a single shilling."

The steady labours and manifold difficulties which an editor must expect to encounter, Young hardly comprehended, or bore with sufficient fortitude—neither could he let the readers of the Annals long remain utterly in ignorance of these little miseries; and one or two of his remarks, moreover, betray the fact very clearly, that the farmers of his day were not made up of the same materials as those which adorn the more reading, more enlightened cultivators of our age. He remarks, when speaking of the progress of the Magazine—" One of the most disagreeable circumstances in editing such a performance, is the disgust which is now and then given to correspondents; perhaps, I might say, that is unavoidably taken by such as are apt to expect too much. In transactions with any class of mankind, such dispositions will sometimes occur, and they are found in very worthy and respectable persons; but the result is unpleasant to the feelings of an editor. There is another circumstance in the conduct of it, which, in direct justice to myself, I ought to explain, because it is an answer to a few persons who have thought the price too high for the quantity of practical husbandry in it. I originally planned the work, expecting that it would be carried on by the insertion of sterling *practical* papers *only*."—Having given an account of how much he was disappointed in this exhibition, he proceeds—" There are, therefore, evils in such a publication that are utterly unavoidable, and that of bulk is one. I must observe, however, that it is by far a greater evil to the editor than to any of his readers; for he is obliged to provide this quantity how he can, but they are not bound to read a single page of it. I have been hitherto able to secure, with the assistance of my friends, materials which, in the opinion of very competent judges, have been valuable; and though not consisting of practical husbandry, yet so connected with the philosophy, theory, and virtually even with the practice of the art, as to render the work a valuable repository, without recurring at all to practice. But, were the fact otherwise, and these additions mere makeweights, it is the public neglect of practical agriculture that should be blamed rather than the editor of such a publication. It may be cited as a proof of culpable inattention in country gentlemen, in the clergy who farm, and in opulent tenantry, that they do not give better encouragement to such a work, which unquestionably contains much valuable information, and which in price never yet arose to a guinea a-year. Let those who condemn my conduct tell me if the Annals are not deserving of a better regular sale than 350, at which number they stand at this time." "But let me," he very sensibly remarks, "hasten this narrative, which has run to a length I did not expect, it will always be so when the question is a register of human follies. Would to Heaven I could conclude without adding to the list!" "I do not know," he adds at the conclusion of his sketch of his own life, "whether I have in this narrative sufficiently condemned my conduct, though I sincerely meant it; for I sat down much more inclined to write a satire than a panegyric. But I have spoken so much of my own imprudence, that I must throw in (the candid will, I hope, pardon it) a word of apology. I have not been imprudent to indulge myself in personal gratifications. The money which I have expended in far different pursuits would have supported not an unhandsome style of living. It would have enabled me to have given my friends, and the very numerous travellers from all nations who have honoured me with their visits, a very different reception. It would have enabled me in all my various excursions, both at home and abroad, which have not in agricultural journeys fallen short of 20,000 miles, to have moved with some of the comforts which a manufacturer or a tradesman enjoys in travelling; it would, in a word, have smoothed a thousand of those asperities which have harassed me through life, and what would have been a wiser course far, had prudence saved it, it would have left me at ease for the remainder of my life, and my children would have had no reason to complain that I had paid a great deal too much attention to the public and too little to them." In conclusion, he dates his narrative "from the fireside of my chamber, December 24, 1790."

In August 1791 (Annals, v. xvi. p. 481) we find that Arthur Young again visited the celebrated Bakewell at Dishley, after a short tour which they made together in Northamptonshire. "Every day," observes Young, after viewing Bakewell's valuable stock, "I am more convinced that the world pays attention to nothing so much as *price*. If Mr Bakewell gave away those tups, which he lets, as the world says, for L.1000, what would be the consequence? No other than a mutton value would be fixed upon them, and he would scarcely be cold in his grave before the breed would be absolutely lost for want of care; but by fixing an immense price upon them, they are solicitously and anxiously attended to, and will, by the progress of improvement, owing wholly and absolutely to price, be carried to a perfection of which we have at present few ideas"

In 1792, Young received from George III. a present of a Merino Ram, a kindness which at once soothed and gratified our author. He gave an engraving of it in the Annals, vol. xvii. p. 529; and he there remarked,—"How many millions of men are there that would smile if I were to mention the sovereign of a great empire giving a ram to a farmer as an event that merited the attention of mankind; my ideas are cast in a very different mould, and I believe the period is advancing with accelerated pace that shall exhibit characters in a light totally new, that shall pay more homage to the memory of a prince that gave a ram to a farmer than for wielding the sceptre, obeyed alike upon the Ganges and the Thames." "When we see," he adds, "the royal pursuits taking such a direction, we may safely conclude, that the public measures, which, in certain instances, have been so hostile to the agriculture of this country, have nothing in common with the opinions of our gracious sovereign; such measures are the work of men who never felt for husbandry, who never practised, who never loved it; it is not such men who give rams to farmers."

A new arena for the display of his talents now opened for Young. The Board of Agriculture was established in 1793, of which he was immediately appointed the secretary, with a salary of L.400 per annum, and an official residence. When he received this appointment, one so congenial to his tastes, he had just completed the purchase of an estate of 4000 acres of poor waste land in the north of England, which he intended to bring into cultivation; but these views were now abandoned; he entered upon a situation which he retained until his death. He describes the Society at p. 129 of vol. xxi. of his Annals. But from the first, this long since defunct Board of Agriculture laboured under many difficulties, and had to contend against much mismanagement, too strong a political feeling, and, perhaps, the disadvantage of being a government board.

In vol. xxiii. p. 172, Young describes his visit at Sandalford, near Newbury, to Mrs Montague, and also to the farm of Prosperous, where once dwelt the equally celebrated and the equally irritable Jethro Tull. "I took," he remarks, "the opportunity of a few very agreeable days passed in this mansion of taste and genius, to go to Prosperous farm, once the estate and residence of the celebrated Jethro Tull, which he has rendered for ever famous by a work which will unquestionably carry his name to the latest posterity. Here it was that he practised and registered that drill culture which has been the origin of so many experiments, and the basis of so many publications, in almost every language of Europe. The house itself, not the less interesting to me for being so very humble, tiled as part of it is with glazed tiles of Tull's own manufacture, was an object, for I have a very great though melancholy pleasure in viewing buildings and spots that have been the residence of persons who rendered themselves celebrated by their actions or their writings, and particularly such as were noted for their exertions in husbandry. Every part of his works manifests strong alents, and no inconsiderable learning, and he has left a name in the world which will probably last as long as the globe we inhabit."

In volume xxxiii., Young commenced, p. 577, his excellent essay on manures—an attempt in which he met with his usual success, and conducted with all his wonted energy. He saw very clearly the importance of researches into the properties of the various manures employed by the farmers, and here it was that he laboured with very considerable advantage, and with an industry which appeared never to relax. On this theme he was ever practical—full of research, ready at invention, and noting the results of his trials, whether successful or otherwise, with all the anxiety of a lover of truth.

No one could love his country with more warmth than Arthur Young, his devotion to liberty, and improvements of all kinds, was equally intense. He let no occasion escape him to promote the interests of either. He says, p. 486, vol. xxxix. when speaking of the well known Travels in the East. "Shaw describes a country and climate as delicious as imagination can paint, excellent in two circumstances essential in such an inquiry—health of body and vigour of mind. The first is the most solid foundation of human happiness, the latter essential to assert and protect that independence and liberty, without which, all the rest is of little account. The soft, effeminate, and indolent inhabitants of rich plains under a hot sun, are all over the world driven like sheep before a handful of mountaineers."

The great defect which pervades the Annals of Agriculture, now became more and more prominent—an intense love of political, and even religious disputation, statistical calculations too, acts of Parliament of full length, revenue accounts of all kinds were admitted in the greatest profusion; in fact, the whole affair was managed with but little editorial skill. Some of the articles are of an unnecessary length, but the great mass by far too brief. These defects evidently became more apparent about the period that he entered upon his duties as secretary to the Board of Agriculture—he had then to attend to the interest of another periodical on "the Communications to the Board," and must have had many other harassing occupations. These defects, however, were soon supplied, and from the period to which I have alluded, till his increasing blindness and other causes, induced the publication of the Annals of Agriculture to cease in 1807, a new and perhaps improved style pervaded its pages; it was printed no longer by a country printer; had for its publisher Sir Richard

Phillips, and for its assistant editor, the Rev. Arthur Young, the son of the subject of this memoir, who being deputed in 1806 to visit St Petersburg, to communicate to the Russians the agricultural improvements of England, purchased an estate in and settled in the Crimea.

During the period that Young edited the Annals of Agriculture—and the same remark will, in general, apply to all his published works—he laboured on all occasions to promote the increased prosperity of the farmer: thus he enforced with much talent and zeal the general introduction of green crops, instead of the often-repeated fallows, and the bad rotation of crops, which had hitherto been the miserable custom of the English farmers. He told them very correctly, that whenever very good or very bad husbandry is found on arable land, it is more the result of a right or wrong arrangement of crops than of any other circumstance; that no district is well cultivated under bad rotations, while it is extremely rare to find any badly cultivated under such as are good. This, and the more general introduction of the drill, were perhaps the two greatest improvements made in agriculture during Young's time. It is true that other highly important efforts were made to add to the productiveness of our island, that more attention began to be paid to the use of improved varieties of grass-seeds and agricultural implements, but none of these were equal in importance to the two first named improvements. Young, too, did not omit to pay attention to the improvement of live stock; he was the contemporary of Bakewell of Dishley, Culley of Fenton, Collings of Brampton, and other great and eminently successful breeders, to whose merits he was ever nobly and zealously ready to bear testimony—assisting them on all possible occasions, both publicly and in private, with his counsel and his encouragement. There is, in truth, in none of Arthur Young's works, any traces of a want of liberality, or of any attempts to "damn with faint praise" those who were, like himself, exerting themselves in favour of the cultivators of England. And if his various practical text-books for the use of farmers are not now so generally read as formerly, it is merely because the great march of discoveries, many of which Young himself suggested, has caused them to be supplanted by other works, which contain more modern, and more clearly established facts, than those of which he had the advantage of possessing.

The following is the list of the chief of Arthur Young's published works:—1. The Farmer's Letters, 1767, 8vo, 1 vol; a second vol. 1771, 8vo.—2. A Six Weeks' Tour through the Southern Counties of England and Wales, 1768–69, 8vo.—3. A Treatise on Hogs, 1769, 8vo.—4. A Six Months' Tour through the North of England, 1770, 4 vols. 8vo.—5. The Farmer's Guide, 1770, 2 vols. 8vo.—6. Rural Economy, 1770, 8vo.—7. A Course of Experimental Agriculture, 1770, 2 vols. 4to.—8. The Farmer's Tour, 1770, 4 vols. 8vo.—9. Proposals for Numbering the People, 1771, 8vo.—10. Observations on Waste Lands, 1772, 8vo.—11. Political Arithmetic, 1774, 8vo.—12. Tour in Ireland, 1780, 2 vols. 8vo.—13. An Essay on Coleseed, 8vo.—14. Annals of Agriculture, 8vo, 1790 to 1804, 44 volumes.—15. On the Wool Question, 1787, 8vo.—16. The Example of a Farmer, 1793, 8vo.—17. Travels in France, 1792, 1794, 4to.—18. The Agriculture of Suffolk, 1797, 8vo.—19. The Agriculture of Lincolnshire, 1799, 8vo.—20. On the Application of Waste Land, 1799, 8vo.—21. The Farmer's Kalendar, 1800-1-2-3-4, 4 vols. 8vo.—22. Essay on Manures, 1804, 8vo.—23. View of the Agriculture of Essex, 1806–7, 2 vols. 8vo.—24. Report on Inclosures, 1807–9, 8vo.—25. View of the Agriculture of Oxfordshire, 1808, 8vo.—26. View of the Agriculture of Sussex, 1808, 8vo.—27. On the Board of Agriculture, 1809, 8vo.—28. On the Husbandry of Bakewell, Arbuthnot, and Duckett, 1811, 8vo.—29. On Money, 1812, 8vo.—30. Essay on Manures, *Nicholson's Journal*, vol. xxiii. p. 120.

I have, however, the more closely followed, in this essay, the course of the "Annals," because I feel that with its publication most of the public efforts of Young are closely related. During its progress he travelled—and he always published a popular description of his travels—over most parts of England, into Ireland, and in France.

In 1793, as I have before remarked, animated, as he always was, by the spirit of adventure, he completed the purchase of 4400 acres of waste land in Yorkshire, intending to bring it into cultivation. But other objects now attracted his attention. The Board of Agriculture, on the motion of Sir John Sinclair, was established, as I have before described, in 1793, and he was immediately made its Secretary. "An individual," says Dr Paris, "is rarely appointed to an official situation on account of his possessing, in an eminent degree, those qualifications which its duties require; but in the instance of Young this was undoubtedly the fact;

his general and profound knowledge in agriculture was the only circumstance that marked him as the most proper person to fill a situation in every respect so important and honourable." "The gratification," he observed, "of being elected into a situation in which opportunities of still giving an humble aid to the good cause of the plough could scarcely fail of presenting themselves, would not permit me to decline the appointment, although, to a person established in the country, the salary (L.400 per annum, with an official residence) was not that pecuniary object which has been represented. What a change in the destination of a man's life! Instead of entering, as I proposed, the solitary lord of 4000 acres, in the keen atmosphere of lofty rocks and mountain torrents, with a little creation rising gradually around me, making the desert smile with cultivation, and grouse giving way to an industrious population, active and energetic, though remote and tranquil, and every instant of my existence making two blades of grass to grow where not one was found before —behold me at a desk, in the smoke, the fog, the din of Whitehall. The die, however, is cast; and my steps may still be metaphorically said to be in the furrow."

In 1801, by the express direction of the French Government, his works were translated and published at Paris, in 20 volumes octavo, with the title of "*Le Cultivateur Anglois.*"

He received in 1808, from the Board of Agriculture, a gold medal "for long and faithful services to agriculture." Shortly after this just tribute to his merits, however, "his active pursuits received a severe check from the failure of his eyes; an incipient cataract betrayed itself, and he soon became unable to take his usual exercise; his digestion, therefore, became disordered, and I have no doubt," observes Dr Paris, "but that the fatal disease which terminated his existence, is to be attributed to this sudden change in his habits. It is a very remarkable fact, that during his whole life, which was blessed with an uninterrupted share of health, he entertained the greatest horror of two diseases,—blindness and the stone; and we find him afflicted with the former at seventy years of age, after an unsuccessful operation in 1811; and that at the advanced period of eighty, his life was terminated by the severe sufferings attendant upon the latter. Although his blindness deprived agriculture of an active and laborious investigator, yet the political economist continued to derive from his extensive knowledge and sound judgment most valuable assistance; and he was continually consulted and examined upon various subjects, which occupied the attention of Parliament. The Board of Agriculture also continued to profit by his assistance,—he delivered before them a variety of lectures upon the application of manures and the improvement of waste lands, and on other subjects of practical importance. Nor did he abandon those habits of industry which had ever distinguished him; he rose every morning at five o'clock, and regularly heard the different new works read; he was also engaged in preparing for the press a large work on the elements and practice of agriculture, which contains his experiments and observations made during a period of fifty years."

From the conclusion of his great work, the Annals of Agriculture in 1807, to the period of his death, Arthur Young continued unwearied at his post, endeavouring, on all occasions, to serve the cultivators of his country, not only as secretary to the Board of Agriculture, and by his county surveys, and other considerable works, but by his visits to various agricultural districts. But old age gradually crept on, and with it came one or two of its complaints, and at length he was seized by the disorder which at last carried him to his grave. His end was peace; he died as tranquilly as the old British farmer should do;—"Pious resignation," says Dr Paris, "cheered him in his illness, and not a murmur of complaint was heard to escape his lips." He died on the 12th of April 1820, at his house in Sackville Street, and lies buried in the churchyard of Bradfield, near Bury St Edmunds. "His numerous works" are pretty correctly described by his biographer, as being "distinguished by vivacity of thought, quickness of imagination, bias to calculation, and fondness for political speculation; and had they been less successful, posterity might, perhaps, have regarded these traits of genius as fatal defects, and as pregnant sources of fallacy and disappointment." And here Dr Paris was evidently unwilling to acknowledge what truth did not allow him to deny, that these traits in the works of Young did detract, and materially too, from his sphere of usefulness; for with all his abilities, he was much too often and too keenly occupied in political affairs, to allow him to have a fair hearing from those who disagreed with him in his opinions. By such he was naturally suspected and disregarded; yet in spite of all these drawbacks, the career which he ran was both useful and honourable, not only to himself, but to the cultivators of the land of his birth. He did, it is true, less for agriculture, by his own discoveries, than by his published works, but in these last, the sensation he produced was not only very considerable, but of incalculable benefit to the English farmer; for he made agriculture generally popular,—he induced the high and powerful of the land to engage in farming,—he raised he created, a new tone amongst the cultivators of our island; he stimulated inquiry, he instituted experiments, he taught his contemporary farmers, and he instructed them truly too, that their profession was one which could never be completely learned, but that it was a noble pursuit, which would ever well repay the most anxious, the most laborious, inquirer, for all his searches after knowledge. And although Arthur Young has been since well followed by many writers who have had the benefit of his experience, without possessing more zeal or more energy, yet he will ever be entitled to the grateful remembrance of the British farmer, as being the first modern author who stimulated that noble march of improvement of which we are now happily reaping the advantage.

ON INSECTS MOST INJURIOUS TO VEGETABLES AND ANIMALS, AND THE MEANS BEST CALCULATED TO COUNTERACT THEIR RAVAGES. —No. XIII.

By James Duncan, M. W. S.

The two moths which constitute the genus Porthesia (a term derived from a Greek word signifying devastation) are always common in many parts of the country, and at times increase to a very injurious extent. Indeed, they may be ranked among the most prejudicial inhabiting Britain; and one of them is remarkable for having on one occasion given rise to a degree of alarm in England greater than perhaps was ever produced by a similar cause.

Yellow-tailed moth. Porthesia chrysorrhœa, Donovan's Brit. Ins. vol. 1. pl. 10. The distinctive properties of this genus are to be found in the short palpi, with the basal joint very minute; the antennæ short and bipectinated in both sexes, but the pectinations shortest in the females; the spiral tongue very short; wings deflexed and nearly trigonate, thickly clothed with scales; legs thick and very hairy; abdomen with a large tuft of hairs at the hinder extremity. The species above named measures about an inch and a half across the wings, the female often somewhat larger; the general colour of the surface snow-white: shaft of the antennæ white, the pectinations dull yellow; upper wings with a dusky spot on the hinder angle next the body, very distinct in the male, but nearly obliterated in the female, underside of the same wings with a broad dusky cloud ; abdomen white, the large hairy tuft at the extremity yellow, inclining to tawny.

The female usually lays her eggs on the underside of the leaves of trees ; and as the caterpillars feed on a great variety of trees with apparently equal relish, she is no way particular in her choice ; fruit-trees, unfortunately, are often selected. The eggs are round, and of a golden yellow, one female depositing from two to three hundred. They are laid in a heap, and carefully covered up with the down which composes the tuft at the extremity of the abdomen. This she plucks off by means of a pair of anal pincers, apparently bestowed on her for the express purpose ; and with the same instrument she arranges the eggs, and spreads over them the thatch which is to form a defence from the weather. The caterpillars commonly make their appearance in June and July. When young, they are of a dirty yellow colour, with a black head, a dark ring round the neck, and four rows of dark dots along the back. The colour of the full grown caterpillar is dusky, with a broad red band on the back, divided by a narrow black line ; there is a series of white spots on the sides, and a red line beneath. In all the stages of its growth, it is thickly covered with hair, rising in dense tufts from each segment.

These caterpillars are, strictly speaking, gregarious ; not only feeding in company, but living in colonies under a common tent constructed by their united labours. When a detachment of them are about to commence eating a leaf, they make a web over themselves, drawing threads from one side to another so as to make the leaf bulge a little outwards. Under this awning they live in comparative security both from unfavourable weather and the attacks of parasitical hymenoptera ; and as they consume only the pulpy substance of the leaf, the floor of their dwelling continues sufficiently strong to support them. One leaf being in this way disposed of, they repair to another, and repeat the same process, frequently taking the additional precaution of fastening the footstalk of the leaf to the twig from which it springs, that it may not be borne down by their weight. These, however, are but slight and temporary structures ; they form others of a more extensive as well as substantial kind, which afford better protection in bad weather, and serve them for a dwelling during the winter months. This they do by winding threads round the extremities of the shoots, and matting them together till they form a dense and strong web of grey silk; most commonly a few leaves are included, which serve to thicken the walls and render them more compact. These nests have, of course, no regular form, as that is wholly determined by the disposition of the twigs on which they happen to be placed. When they are in a complete state, as an abode for the winter, they are found, on being laid open, to be divided into many compartments, each of which is inhabited by one or more individuals. The walls of these chambers are thickened as the weather becomes colder, and they doubtless render the abode greatly more comfortable than if the whole formed one cavity. They generally cease feeding about the middle of September; occasionally leave their quarters for a short period during warm days in November, but never go to any distance; and after the termination of the last mentioned month, they usually become torpid. Scarcely any degree of frost that occurs kills them; they have been known to continue uninjured when the thermometer was 60° below zero.

These caterpillars leave their winter quarters as soon as the warmth of spring is somewhat confirmed. They then scatter themselves over the trees, and attack the buds as these are beginning to expand, frequenting the sides of the tree most exposed to the sun. If the weather be ungenial, some of them occasionally spin coverings of web, as on the preceding summer, or repair again to the old winter nest for temporary shelter. After several moultings, or changes of skin, they reach their full growth, when they present the appearance formerly described. They then prepare for becoming pupæ, when several of them unite in drawing a few leaves together into a kind of ball, within which they weave a brown web, which envelopes a greater or less number of them, commonly from six to ten, while they are in this dormant stage of their metamorphosis.

As these caterpillars, as already intimated, are polyphagous, no kind of tree can be considered secure from their invasions, but pear and apple trees, the hawthorn and sloe, the oak and elm, are by far the most subject to their depredations. The habits of the species next to be described, are in every respect similar; and any remedial or preventive measures that can be suggested, will apply equally to both.

Brown-tailed Moth. Porthesia auriflua. Donovan's Brit. Ins. x. pl. 555. *Phal. Bombyx phœorrhœa,* Curtis. Scarcely so large as *P. chrysorrhœa*; wings pure white above, the underside of the upper pair with a narrow dusky cloud towards the anterior margin in the male, but wanting in the female; head, thorax, and abdomen white, the hinder extremity of the latter with a yellowish tuft in the male, the corresponding tuft in the female being brown; shaft of the antennæ white, the pectinations rust-red.

The caterpillar is dusky, with two red lines on the back, and a white streak on the sides interrupted at intervals; the lateral tufts of hairs white. According to Curtis, who published an excellent account of the ravages of this creature in 1782, "It is found on the hawthorn most plentifully, oak the same, elm very plentifully, most fruit-trees the same, black thorn plentifully, rose-trees the same, bramble the same, on the willow and poplar scarce. None have been noticed on the elder, walnut, ash, fir, or herbaceous plants; with respect to fruit-trees, the injuries they sustain are most serious, as in destroying the blossoms as yet in the bud, they also destroy the fruit in embryo; the owners of orchards, therefore, have great reason to be alarmed." In the summer of the year above mentioned this insect abounded to an extent of which probably no previous example had ever occurred in this country. In many of the parishes near London, subscriptions were made for the purpose of employing people to gather the webs from the trees, for which they were paid at the rate of a shilling the bushel. Their prodigious abundance may be learned from the fact, that in one parish only, that of Clapham, 80 bushels were collected in a single day. The webs, with their contents, were then burnt under the inspection of the overseers and other parochial functionaries. The occurrence created a considerable degree of alarm; it was looked upon as a precursor of the plague, and the greatest apprehensions prevailed that the caterpillars, after defoliating the trees and bushes, would attack corn and pasture grasses. Under the fear that a great national calamity was impending, prayers were offered up in many of the churches that the country might be delivered from such a scourge.

The forests and orchards of France have often suffered from this pest in an equal if not greater degree, so as to induce the legislature to promulgate ordonnances for their destruction. In the years 1828 and 1829, they were very generally prevalent, and caused great loss. Every year both the species are more or less plentiful in Britain, and are distributed throughout the whole country, although they multiply most in the south.

As with all insects liable to increase beyond due limits, both the yellow and brown-tailed moths have many natural enemies designed to keep them in check. A very minute four-winged parasitical fly oviposits in their eggs, and these are consumed by the larvæ in great numbers. A larger parasite, an Ichneumon, pierces the caterpillar; and other carnivorous insects greatly contribute, along with birds, to thin their numbers. As to the artificial means that should be adopted for clearing the trees, various methods may be practised with greater or less success. The continental plan of uncaterpillaring the trees, has perhaps more to recommend it in this instance than in any other. This consists of cutting off the twigs that have nests attached to them; and as these are often in situations when they cannot easily be reached by the hand, a peculiar kind of instrument is employed for the purpose. It is nearly the same as what is called an averruncator in this country, generally consisting of a pair of strong scissors, attached to the end of a very long handle. One of the blades of the instrument is moved by means of a cord running along the handle, so that when the blades are separated the twig can be enclosed between them, and the movable one being drawn forcibly down by the cord, easily separates the twig.

The removal of the nests, either by the above instrument or other means, is most effectively performed at that season of the year when the caterpillars have all taken shelter within them; at other times their operations will receive only a partial check from such a measure. When the nests are collected, the best plan is to burn them. Detachments feeding under a net-work of silk may be destroyed at any time during the spring or summer, but this is dealing with them too much in detail, and occasions great trouble. Schmidberger recommends that, on dwarf and low trees, the eggs should be sought for and destroyed. They form a mass covered with gold or brown coloured hair, and are therefore not easily overlooked, particularly in the former case. "Should all the masses of eggs," he adds, "have escaped our observation, yet the caterpillars which issue from them cannot long remain concealed, as they leave the traces of their arrival on the shoots, by eating the leaves and only leaving the nervures. As they keep close together at first, and collect together again at night, they may be taken all at once if the shoot whereon they are encamped be cut away and taken out of the garden."

"The seeking for and destroying the eggs and young caterpillars on lofty trees, is, however, not easily accomplished; but it is not so difficult to look for and remove the pupæ. I have observed that the caterpillars are fond of the damson-tree for undergoing their transformations in, and therefore, if any of those trees are growing among or near the lofty apple or pear-trees, let them be searched in the latter part of June for the balls which these insects have made for their retreat while in the pupa state. If there are no damson-trees in the garden, let the drooping branches of the pear and apple-trees, particularly of the latter, be examined, as the caterpillars usually descend to the lower branches to undergo pupation. How much the labour of clearing trees of caterpillars in autumn and spring might be lessened, if people would but take the trouble of looking for the insect in the pupa state!"*

It is stated by Stephens that the two moths in question appear in the perfect state in July and August, and care should be taken to destroy as many of them as possible *on their first appearance.* They are of pretty large size, and a bright white colour, so that there is not the least difficulty in observing them; and they are so sluggish and inactive in their movements, that they may be caught with the utmost ease. It is incumbent on every gardener and forester to use every means in his power to reduce their numbers when they happen to superabound; for, by neglecting to do so, he not only sustains loss himself, but becomes the means of injuring the property of others.

Satin Moth. Leucoma Salicis. Donovan's Brit. Ins. vol. i. pl. 30.—This genus has a good deal of affinity to that last treated of, but may be distinguished from it by the greater comparative breadth and semi-transparency of its wings, the different proportions of the joints of the palpi, the legs being nearly destitute of hairs, and the extremity of the abdomen in the female without a tuft of down. *L. Salicis* is a pretty insect, the wings being entirely white, with a rich satin gloss; such is likewise the case with the head, thorax, and abdomen; the antennæ have the shaft white, the pectinations black; the legs are white, with black rings. The wings of the male expand rather more than an inch and a half, and the female is a good deal larger.

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* Kollar's Treatise on Insects injurious to Gardeners, &c.—Loudon's Trans. p. 196.

The perfect insects, in ordinary seasons, make their appearance in June, and after pairing, the female lays her eggs on the trunk or leaves of willow and poplar trees. These are of a greenish colour, and each cluster is covered and protected by a white smooth scale-like membrane formed of brittle silk. This occurs both on the upper and under side of the leaves, and, from its colour, can be detected without much difficulty. The caterpillars are hatched in about fourteen or fifteen days, and immediately disperse over the tree, for they have none of the social propensities of those last described. When mature, they are from an inch to an inch and a quarter in length, of a dusky hue, spotted with red, and having an interrupted series of white dots along the back; the tufts of hair yellowish. They are often so plentiful as to strip willow and poplar trees entirely of their foliage, in consequence of which young plants not unfrequently perish. They pass the winter in a solitary state, taking up their residence in a crevice of the trunk or branches, or under the bark, and covering the opening of their retreat with a thin web. They are transformed into chrysalides within a loosely constructed cocoon, commonly placed among a few leaves drawn together. The pupa is shining black, with tufts of yellow or whitish hair. They assume this state in June.

Methods of destroying the satin-moth must be regulated by the consideration of the above particulars in its history. Many caterpillars would be killed if the stems of the trees on which they abounded were rubbed with a brush, or something similar, late in autumn or in winter; and, as the bark of willows harbours many other noxious insects, the benefit would not be confined to the removal of the species in question. In early spring, upon first leaving their winter quarters, the caterpillars collect in numbers about the forks of the branches, when a good many might be destroyed without much trouble. If an attempt be made to catch the moths (and this remark applies not only to them, but to others of a similar description), it is unnecessary to waste time in hunting for the males, which are more plentiful than the other sex, but to confine the pursuit to the female, which is easily known by her superior size and distended abdomen.

Black Arches Moth. Psilura monacha. Naturalist's Lib. Brit. Moths, pl. xix. fig. 1, 2.—The male of this prettily marked moth expands from fifteen to eighteen lines, the female nearly two inches. Both sexes vary much in their markings, but the following description will apply to the majority of specimens. The fore wings are greyish-white, with numerous black spots and transverse waved lines of the same colour; there is a regular series of spots along the terminal border; hinder wings brownish-grey, inclining to white behind, the fringe always white, with black spots; thorax white, with black dorsal spots; abdomen rose-red behind.

This insect is not generally distributed in this country,—we are not aware that it occurs at all in Scotland,—but in certain localities it sometimes appears in great numbers, and it is so well known for its ravages among the pine forests of Germany and elsewhere, that we could not omit taking notice of it in this place. The female insinuates her eggs, by means of a pretty long horny ovipositor, into the cracks in the bark of old pines, and occasionally of other trees; they are laid in clusters, varying in size according to the dimensions of the hole. They are flat on the sides, so that they can be packed pretty closely together, and they are sharp and rough to the touch. In the more northern parts of the Continent (it does not appear whether the same thing takes place in this country), the eggs remain unhatched throughout the winter, the young caterpillars not appearing till March or April. They continue in company for a while in an inactive state, as if waiting to acquire strength for active exertion, a favourable opportunity for destroying them which should not be allowed to escape. When full grown they are from one and a half to one and three quarter inches long; the colour greyish-brown, mixed with black; head grey, with a brown line along the forehead, ending in a triangular spot over the mouth; body with a brownish-grey stripe on the back, a little interrupted before reaching the hinder extremity, each of the segments with tufts of a brownish-grey colour tinged with blue, those immediately behind the head being longest; pectoral legs yellow. The pupa or chrysalis is brownish-black for a while after being formed, but becomes nearly black, with tufts of reddish-brown hairs, the anal extremity beset with hook-shaped bristles. It is inclosed in a slight web.

This insect attacks different kinds of trees besides firs and pines; it has been most frequently observed in this country on the oak (particularly in the New Forest); it also frequents elms, limes, and willows. These, however, it commonly leaves untouched when its favourite food is at hand. As a proof of the extent to which its depredations are sometimes carried, it may be mentioned that Bechstein affirms of the injury it committed in the years 1795 and 1798, in Vogtland, Prussia, and in some parts of France, that "it will not be repaired in a hundred years." He even recommends that, when other measures are found insufficient, the whole of the trees in the infested district should be cut down, or so pruned that the insects upon them may be completely rooted out; a deplorable expedient to which, it is hoped, there will be no occasion in this country to have recourse.

The Antler Moth. Charæas Graminis. Donovan's Brit. Ins. xiii. pl. 458. The essential characters of this genus are, that the two lower joints of the palpi are shorter than the following, and densely covered with scales, the terminal one elongate and acute; spiral tongue, long; antennæ simple in the females, more or less pectinated in the males; thorax not crested; apex of the abdomen tufted in the males. The species named *Graminis* is thus described by Stephens. Head and thorax pale griseous-brown; anterior wings the same, with a longitudinal whitish line reaching from the base to beyond the middle, and giving off three branches in the direction of the nervures towards the anal angle (it is from this mark that the insect gets its English name); between this and the costa the stigmata are placed; these are of a pale luteous, with the margin paler; the space between and on the margin is dusky; on the inside of the longitudinal line is an elongate lutescent stigmatiform spot, bordered towards the inner edge of the wing with black; beyond the ordinary stigmata, towards the hinder margin, is a repanded striga of somewhat acute black streaks; the posterior wings are fuscous, with the margins darker and the cilia yellowish; the body is fuscous, and the antennæ ferruginous; expansion of the wings from an inch and a quarter to an inch and a half.

The caterpillar of this moth is very different in its economy from any of those above noticed, as it lives under ground and feeds on the roots of grasses. The eggs are probably laid among the radical leaves of plants, and as soon as hatched the caterpillars find their way downwards and dig into the soil. The caterpillar is brown or blackish, with light-yellowish stripes along the back and sides; the first and last segments protected by a hard smooth plate. When they reach their full size they are about an inch long. They change to a brown shining pupa towards the end of June, enclosed within a light cocoon, under moss, among stones, or in such like places.

The injury done to pasture land by this moth is sometimes very great. It seems to avoid low-lying meadows, probably on account of their dampness, and is generally found in hill-pastures. It appears to be of more frequent occurrence in the North of England and in Scotland, than further to the south. The following account conveys a good notion of its mode of proceeding:—"Though the devastations committed by the larvæ of this moth in our own island do not in general appear to bear any comparison with its ravishes in the Swedish pastures, yet when, from the failure of some of the checks appointed to keep it within proper bounds, the species is left to increase unmolested, its effects are very apparent, as the following instance will shew. Some years ago (in 1824, I believe), during the spring and early summer, the herbage of a large portion of Skiddaw, near the well which most tourists visit in the ascent previous to climbing to the summit of the last *Man*, comprising at least 50 acres, and extending some distance down the western side of the mountain, was observed, even from the town of Keswick, to assume a dry and parched appearance; and so marked was the line that the progress made by the larvæ down the mountain, could be distinctly noted. Nor was the change of colour of the herbage the only thing that attracted the attention of the good folks of Keswick ; large flocks of rooks, attracted no doubt by the abundance of food which these larvæ afforded them, were every morning seen wending their way to the spot, both from the rookeries in Lord's Island and other places in the vale of Keswick, and also from those of distant ultramontane parts of the neighbourhood, and after spending the day in preying upon the unfortunate caterpillars, on the approach of night, rising in one dense cloud, and dispersing to their respective homes. Though their numbers must have been in this way greatly reduced, yet I was informed by a very intelligent friend, residing at the foot of the mountain, that in August the moth literally swarmed throughout the neighbourhood. So completely was vegetation destroyed, that, on a visit to the spot in 1830, the extent of their ravages was distinctly visible, being very similar to the effect produced by the burning of heath, which is so much practised on all our hills. Of course, the quality of the newly grown herbage was materially improved, thus affording another instance of the indirect advantages derived from insects."

On a subsequent occasion, August 1831, the same writer found the moths very abundant in another part of the country, and mentions some curious particulars illustrative of their habits. One morning he found a field actually swarming with them, so that it was scarcely possible to walk without treading upon them ; but upon returning, after breakfast, for the purpose of obtaining specimens, they had entirely disappeared, and he had the greatest difficulty in finding a single individual. Next day not one was to be seen, but about seven o'clock on the following morning they again appeared. "Sudden as their appearance had been, their disappearance was equally so, when, as with one general consent, about half after eight, they again settled ; and their flight for the morning being over, scarce a solitary specimen was any where to be seen. The moths flew about three or four inches from the ground, and apparently very seldom alighted, but threaded their way most dexterously among the long culms of the grasses."*

The Dart Moth. Agrotis Segetum.—The group of moths included under the generic term Agrotis, is composed of a considerable number of species, differing a good deal from each other in appearance, and many of them so extremely variable in their markings, that it is not easy to determine what are their essential distinctions. More than one species are injurious to grass and corn-fields; but the most formidable, not only of this genus, but almost of the whole tribe of moths, is that named above. It is of ordinary size, the wings expanding from an inch and a half to an inch and three quarters. The head and thorax are pale brown, mixed with grey, the fore-wings of the same colour, with a pale streak at the base, an undulated one before the stigma, a third of very variable form beyond that, and finally a waved band, composed of pale crescent-shaped spots on a dark ground, towards the hinder margin; hinder wings white (tinged with blue in the female), the nervures a little dusky; abdomen ashy-brown. These may be said to be the characteristic marks and colours, but two specimens are scarcely ever found in every respect alike. The fore-wings are sometimes of a very dark colour, at other times of an ash-grey; and endless modifications occur in other particulars.

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* Entomological Magazine, vol. i. p. 201.

The eggs are laid in the earth, and the caterpillars are disclosed from them in ten or fourteen days. They are about an inch and a half long, when at their full growth, and about the thickness of a goose-quill; the body cylindrical, a little narrowed behind. They have six pectoral feet, as is the case with all caterpillars, and ten feet on the ventral portion of the body. The surface is smooth and shining, without hairs, being thus extremely well adapted for gliding among loose soil. The prevailing colours are brown and dark grey, arranged alternately in broad stripes, but these stripes often running into each other. A pale line, bordered on each side by a darker one, runs along the back; and there are four faint black spots on each segment. The head is yellowish-brown, with two lines of confluent dark brown spots, running from the mouth backwards. They feed principally on the roots of corn, occasionally also on the lower leaves, but their attacks are commonly confined to the portion of the plant below the surface. Various kinds of culinary vegetables likewise suffer from them, and also turnip fields; but it is as an enemy of the corn crops that this insect is chiefly to be dreaded. "It is a great pest," says Stephens, "in several districts, and abounds to a most destructive extent in certain years; the larvæ doing incalculable mischief by destroying the young corn, insidiously devouring the roots and base of the plant, while the blade is left untouched. In the autumn of 1826, and the succeeding spring, the larvæ abounded; and in June following the imago actually swarmed in the neighbourhood of Ripley, the hedges for nearly three weeks being literally alive with their multitudes. About the same period the lands in the neighbourhood of Barham, in Suffolk, were similarly visited."* We have seen large fields of corn in the Lowlands of Scotland so seriously injured by the caterpillar of this moth, that they had to be reploughed and sown anew. Germany, Poland, and Russia, have often suffered to a great extent from the same cause; and the government of the latter country, on one occasion, offered by public advertisement a high reward to any one who could discover an effectual remedy. The Entomological Society of London, also, made it the subject of their prize essay for the year 1839. But notwithstanding all this, our acquaintance with the history of this moth is not so complete as is desirable, nor are the means of preventing its ravages altogether satisfactory. The caterpillars proceeding from eggs laid about midsummer or in autumn, always survive the winter, and they are therefore very liable to attack winter wheat. When the weather, however, becomes very cold, they descend pretty deeply into the earth, and prepare a kind of cell for themselves, in which they remain in a semi-dormant state. The approach of spring renews their activity, and they are in full vigour just about the time the young braird begins to cover the fields with verdure. The change to a pupa takes place in the end of May or June, in a small hollow, a little beneath the surface, and that state continues, on an average, for about four weeks.

The whole life of the insect, therefore, except in its winged condition, is subterranean, or nearly so, and this must determine the nature of the methods to be adopted for its destruction. Several of the plans formerly recommended for this purpose in reference to root-eating grubs—that of the cockchafer, for example, may be employed with advantage in the present instance. It is scarcely worth while to attempt to kill the moths shortly after their birth, because, for the reasons stated by Köllar, it is scarcely possible to do this effectively. The moth does not fly during the day, and it is so inconspicuous, from its colour being nearly the same as that of the soil, that it is not easily observed even when a search is made for it. Fires have been sometimes lighted in the night, in different parts of a corn-field, to attract the insects, and many are scorched by flying into the flame, while others may be swept into it by a person stationed near with a hand-net. But this plan is attended with comparatively little advantage, from the two following considerations: The moths are not all disclosed from the pupæ nearly at the same time; it would therefore be necessary to continue the fires for a considerable period, at a trouble and expense which few would be willing to incur. Moreover, it is generally the male insect that appears on the wing, the females being sedentary and inactive; and even if a greater number of the former were destroyed; the breed in all likelihood would be continued with little or no diminution. The pupa could only be reached by some liquid substance, and that would require to be of such a nature as not to injure the corn. It has been suggested, that sowing the winter wheat late in autumn would in some cases be attended with the destruction of the brood, because the caterpillars would appear long before the crop was in a condition to support them. But it is likely that, in such an event, they would have recourse to the roots of pasture grasses and other plants, with which they would make a shift, till their favourite pabulum appeared. Whenever there is any fear of the attacks of these caterpillars, the precaution should never be neglected of mixing the seed-corn with lime before sowing, and if the lime be slacked with some offensive liquid, so much the better. This is always a good and easy preservative, more or less effectual according to circumstances, not only against the enemy in question, but many others of a similar description. It will be rendered still more efficient, if lime, in a dry state, be sown in the field at the same time with the seed corn. It is affirmed that the farmers in Sweden completely protect their fields from these and similar depredators, by sticking here and there in the earth, young fir-trees inverted, with the tops cut off. If this were really found to be a sufficient protection, it is perhaps the easiest one that could be adopted;

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* Illustrations of Brit. Entom. Haustellata, vol. ii. p. 116.

but it has very much the appearance of an empirical remedy, and we can see no reason for the result ascribed to it.

"We have now arrived," says Köllar, after enumerating some of the above modes of prevention, "at the last, the most simple, and assuredly the most certain remedy of extirpating the noxious seed-eating caterpillars from the soil. This remedy consists in the farmer and his whole family repairing to the fields, and collecting the caterpillars as soon as they appear. Similar plans have been suggested for various caterpillars that injure trees and forests, and they are acknowledged to be the best and most to be relied on by the greatest naturalists and most experienced agriculturists. The only question here is, how is the hand-picking to be set about, without spending time unnecessarily. A person unacquainted with the habits of our caterpillars, would seek for them in vain in his fields. We have often observed they cannot endure the light of the sun, and lie in the day time under stones, clods, or buried in the earth. Stones and clods of earth, both large and small, must therefore be carefully turned up in search of the enemy. When they are changing their skins they come out of their lurking places, even in the day time, and can easily be gathered. Immediately after sunset they come out in great numbers, and feed greedily on the young corn. At this time, therefore, the work must be carried on with renewed vigour, and even till late at night, with lighted fir-torches or lanterns. The collected caterpillars are best destroyed by throwing them into a hole, and setting fire to brushwood over them."* It is judiciously added by this writer, that all the agriculturists of a district should unite in this work, that the labour of one individual may not be rendered useless by the neglect of another; because the caterpillars, when they had eaten up everything on the neighbouring fields that were not cleared of them, would fall upon those that had been cleared.

It has been found, upon trial, that boys can pick about 600 wire-worms in a day, when they are at all plentiful; and in the instance we have at present in our eye, they performed this service for three halfpence per 100. In this way, a farmer in the south of England gathered the surprising number of 18,000; and thus for an expense of L.1 : 2 : 6, saved an acre of turnips of at least seven times that value. This shews the utility of hand-picking, and a similar method may be practised with this and such like caterpillars.

It might be supposed that rolling the ground with a heavy roller, especially at night when the caterpillars come near the surface, and even occasionally above it, would destroy many of them, and probably it would do so; but all caterpillars which live in the earth have a tough elastic skin capable of considerable resistance, and such of them as did not happen to have a stone or other hard substance beneath them, would be merely pressed into the soil without sustaining any material damage.*

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* Treatise on Insects injurious to Gardeners, &c. p. 103.

Of the twenty-seven species of Agrotis found in this country, it is probable that several will be more or less detrimental on particular occasions and in particular localities, but few of them, fortunately, except *A. Segetum*, appear to be generally distributed or very abundant. *A. Tritici*, which is included in our lists of indigenous insects, in consequence of having appeared near London and in the north of England, is at times a most destructive species on the continent to fields of buck-wheat and autumn-sown grain. It is necessary, therefore, that farmers and gardeners should be in a condition to recognise it when it makes its appearance, which they may do by the following brief description:—It is rather less than *A. Segetum;* the fore wings ash-grey, occasionally with a reddish tint; a short dusky streak at the base, a faint ashy streak before the anterior ear-shaped mask, and a curved one behind the posterior; these two stigmatic or kidney-shaped masks large and pale ash-colour; the margin of the wing with a row of minute black spots; fringe pale brown; hinder wings whitish or pale ash-grey, the margin dusky; abdomen the same colour as the hinder wings. The caterpillar is dull olive-green on the back, with a considerable mixture of yellow; each segment with two transverse rows of warts; head brown, with a yellow triangle on the front; abdomen and feet dirty yellow. It lives in the earth, feeding on the radical portions of corn-plants, and never appearing above the surface except in the night. A kind of cocoon is constructed in the earth for the pupa, which is dark brown.

Cabbage-Moth. Mamestra Brassicae.—The genus Mamestra contains a good many species, two of which require to be noticed on the present occasion, on account of their predatory operations in gardens, especially on culinary vegetables. The group is characterized by having the antennæ slender and simple in both sexes; the palpi short and three-jointed, the first and last joints of equal length, the central one as long as both these together; head and thorax with a crest, that on the latter bifid; wings a little deflexed in repose, the fore pair with small teeth on their hinder margin, the hinder pair without teeth. The insects are all of sombre colours, and most of them have a mark resembling a W on the disk of the anterior wings. *M. Brassicæ* expands about an inch and a half; the fore-wings ash-brown, clouded with light ash-grey, and marked with many transverse black streaks, the hinder margin with a white undulated and bidentated stripe, having a series of dusky angular spots in it; the centre with two stigmatic spots, the outermost of which is kidney-shaped and partially margined with white; there are also four white spots on the anterior margin near the outer angle; hinder wings grey, with the centre and hinder margin darkest; head and thorax brownish black, with grey scales intermixed.

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* Some observations on this insect, under the name of *Ægrostis Segetum*, by Mr Towers, will be found in the 9th vol. of this Journal, page 89.

The caterpillar which, like the perfect insect, varies a good deal, is green or brownish, with a dark stripe along the back, on which a pale line is visible; the sides marked with an obscure yellowish stripe, having a tendency to become reddish on the upper side. The spiracles are white, surrounded with black.

White Line brown-eyed Moth. Mamestra oleracea.—General colour rusty-brown; the fore-wings at times slightly clouded, the cross-lines obliterated; the round central spot surrounded with white, and the kidney-shaped one a little beyond it dull orange yellow; beyond these, near the posterior margin, there is a whitish bidentate and undulated stripe; hinder-wings dull white or tinged with ochre-yellow, the border dusky. Caterpillar reddish or yellowish brown, with a dark line along the back, and another on each side, and beneath the latter a white line; under side and feet light brown.

Both the above insects are exceedingly common in almost every part of the country, and the caterpillars feed on a great number of common garden plants, particularly cabbage and its numerous varieties, lettuce, turnips, &c. They are very hurtful to the former, and as they penetrate into the closely folded heart-leaves, they cannot well be removed without wasting the plant, and greatly injuring its appearance. Hand-picking is almost the only method of dealing with them that can be recommended as effectual.

Gamma Moth. Plusia gamma. Donovan's Brit. Ins. vol. viii. pl. 265, fig. 3. *Y-moth, Harris.*—This is one of the best known of our native moths, and every one is instantly able to recognise it by its name, as that is conspicuously emblazoned on its wings. It measures from an inch and one-third to upwards of an inch and a half; the upper-wings grey, variegated with dusky brown, having a pale blotch anteriorly towards the apex, and a few transverse, slightly-waved, dark lines; the disk of each inscribed with a silvery character resembling the letter Y, or rather the Greek γ; fringe somewhat dentate, greyish, spotted with dusky brown. Hinder-wings ash-brown, the nervures and hinder margin deep brown; the fringe light-coloured, with dark spots. The head and thorax are ash-grey; the abdomen of a lighter hue.

The eggs of this moth are very beautiful, being of an orbicular shape, with elevated ribs, and slender, transverse, raised lines. They are laid chiefly on the under side of leaves, sometimes singly, but more commonly in small clusters. When the caterpillars reach maturity, they are green, with six white or bluish lines along the back, and a faint yellow streak on each side; the breathing pores black. They possess only four abdominal feet and two anal ones, thus indicating an approach to the geometrine or looper caterpillars, some of which we shall soon have occasion to describe. In consequence of the absence of legs in the middle of the body, that portion of it is curved upwards when in motion, and the extremities of the body drawn towards each other. They consume a variety of common vegetables, turnips, pease, beans, &c. The chrysalis, which is pitchy-brown, is inclosed in a white woolly cocoon, spun between the folds of a leaf or among the herbage. The perfect moth is found from April to November, flying about in the day, skipping from one plant to another in a restless manner, and with much rapidity, keeping the wings, when feeding, in constant vibration, somewhat like the humming-bird hawk-moth. They may be seen, often in great numbers, hovering in this manner about a turnip-field, over the yellow blossoms of the charlock and field-mustard, or the blue heads of the scabious and devil's-bit.

As there are two broods in the year, and the number of eggs laid by each female about 400, their powers of multiplication are enormous, as we should doubtless find to our cost, were it not for the natural agents by whose operation they are kept in check. Still, the aggregate amount of injury they commit must be great, although we have not heard of any extraordinary instances of superfecundity in any particular locality in this country. Not so, however, in France and other parts of the Continent. In 1735, they destroyed almost all the garden produce of the country intended to supply the markets of Paris, and the people even abstained from soups, and other preparations in which vegetables are used, under the notion that the caterpillars were poisonous. On ordinary occasions, hand-picking is the only remedy that need be resorted to; but if the numbers be very great, such methods may be adopted as have been recommended in regard to the black turnip caterpillar and others of similar habits.

AGRICULTURAL RESEARCHES, NO. II.

ON REAPING WHEAT, NO. 2.

By Mr John Hannam, North Deighton, Wetherby, Honorary and Corresponding Member of the New York State Agricultural Society.

In a former paper on this subject,* I declared my intention of continuing my researches on the proper time for reaping wheat, and of giving the results to the public. Having now completed those investigations, it only remains for me to fulfil the latter portion of my promise. Before doing this, however, I would premise, that the interest which my former experiment excited, not only at home, but also in our colonies, and the United States, induced me to carry out my design upon that scale which I deemed most likely to produce valuable results, and to devote to the subject that care and observation which its importance deserved. In accordance with which determination, not one single operation (neither reaping, stacking, thrashing, dressing, grinding, nor weighing), was carried on without my immediate superintendence. And although the execution of this determination involved the sacrifice of much time and leisure, the results have amply repaid me; by enabling me (as I predicted) to corroborate my former calculations, and to strengthen them by the details of my own positive and practical experience.

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* Quarterly Journal of Agriculture for June 1841.

The field of wheat chosen for my experiment was an even average crop, the soil thin limestone, and the seed the old square-headed red—the same experimented upon before. In the former case, however, the grain was cut at three periods, with an interval of a fortnight between each cutting. In order, therefore, to make the experiment more valuable, and to fix more accurately the golden mean between the too green and the too ripe, I had 20 perches of adjacent furrows reaped at the following periods:—

No. 1,......	reaped	August 12th,......	stacked	August 26th.
No. 2,......	do.	August 19th,......	do.	August 31st.
No. 3,......	do.	August 26th,......	do.	September 5th.
No. 4,......	do.	August 30th,......	do.	September 9th.
No 5,......	do.	September 9th,...	do.	September 16th.

On stacking the various cuttings, I took a sheaf from each parcel, for the purpose of exhibiting a sample of the grain of each at the annual meeting of the Wetherby Agricultural Society, held September 22, 1841. It was also my intention to have sent the same samples, after the above meeting, to the Show of the Highland and Agricultural Society of Scotland, at Berwick, and for this purpose Mr Stephens kindly forwarded to me the necessary certificate; but, to my disappointment, I found that I could not get them forwarded in time.

As in my former experiment, the sample of the ripe wheat, No. 5, appeared bold but coarse, while the green, Nos. 1 and 2, were finer in the skin, but smaller in size. The raw cut, No. 3, however, was unexceptionable as a sample; being equal in boldness and fulness of grain to No. 5, and superior to Nos. 1 and 2 in the thinness and uniform clearness of skin. Scarcely any difference was discoverable between 3 and 4; the latter was, however, rather more rough to the touch than the former.

This superiority of the raw cut grain was observed and acknowledged by hundreds of practical agriculturists at the meeting alluded to, and was confirmed by the judges, who awarded to me one of the extra premiums, "with a high commendation of the sample No. 3, reaped a fortnight before the ripe."*

On February of the present year the whole of the various cuttings were thrashed and dressed under my own eye, when the following were the results:—

No. 1 gave 2¾ bushels of wheat weighing 11 st. 12 lb. and 22 st. 7 lb. of straw.
... 2 ... 2½ ... ... 11 1 ... 21 3 ...
... 3 ... 3½ ... ... 15 10 ... 20 8 ...
... 4 ... $3\frac{11}{16}$ ... ... 16 6 ... 19 2 ...
... 5 ... 3½ ... .. 14 13 ... 18 0 ...

Having in my former trial ascertained the value of the various samples by the opinion of the market, and in this case confirmed it by the public decision of the judges at an agricultural meeting, I determined, in order to leave no loophole for doubt, to test their qualities at the mill, and to see in what, and to what extent, the difference of quality existed. Having, therefore, to prevent mistake, affixed my own seal to the sacks, and placed them under the care of Mr John Hardcastle of Hunsingore Mills, near Wetherby, the gross quantity of each variety was ground and dressed with the following results:—

	Gross Quantity.	Weight of Grain.		Weight of Flour.		Pollard, or "Sharps."		Bran.		Waste.
	Bushels.	st.	lb.	st.	lb.	st.	lb.	st.	lb.	
No. 1.	2¾	11	12	8	12		12	2	1	1
2.	2½	11	1	8	6		11	1	11	1
3.	3½	15	10	12	6		12	2	1	5
4.	$3\frac{11}{16}$	16	6	12	3	1	3	2	5	9
5.	3½	14	13	10	11	1	9	2	5	2

From the foregoing results, then, we deduce the following table of the quantities of flour, seconds, and bran, per bushel, from each parcel :—

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* I quote from the public report of the meeting. *Vide* "Yorkshire Gazette," and "Leeds Intelligencer," for September 25. 1841.

	Flour.	Pollard.	Bran.	Weight per Bush.
No. 1	$45\frac{1}{11}$ lbs.	$4\frac{4}{11}$ lbs.	$10\frac{6}{11}$ lbs.	60 lbs.
2	$47\frac{1}{2}$	$4\frac{1}{2}$	10	62
3	$49\frac{5}{7}$	$3\frac{3}{7}$	$8\frac{2}{7}$	$62\frac{2}{7}$
4	$46\frac{23}{36}$	$4\frac{35}{69}$	$8\frac{13}{36}$	$62\frac{13}{36}$
5	$43\frac{1}{7}$	$6\frac{4}{7}$	$9\frac{3}{7}$	$59\frac{1}{7}$

The same data furnishes us with the quantities, per cent., of flour, pollard, and bran yielded by each parcel ;—thus, 100 lbs. of grain without waste—

	Flour.	Pollard.	Bran.
No. 1 gives	$75\frac{5}{33}$ lbs.	$7\frac{9}{33}$ lbs.	$17\frac{19}{33}$ lbs.
2 ...	$76\frac{47}{77}$	$7\frac{11}{77}$	$16\frac{19}{77}$
3 ...	$80\frac{40}{43}$	$5\frac{25}{43}$	$13\frac{21}{43}$
4 ...	$77\frac{83}{291}$	$7\frac{163}{291}$	$14\frac{206}{291}$
5	$72\frac{196}{207}$	$11\frac{23}{207}$	$15\frac{195}{207}$

From this it appears, that had not the very green failed in quantity, it is superior to the ripe in quality—making more flour by 2 per cent. ; while the raw, No. 3, is superior to all the other varieties. Thus, the bushel of No. 3 gives more flour than the bushel of No. 5 by $6\frac{4}{7}$ lbs., shewing a gain of $15\frac{1}{7}$ *per cent. in weight of flour upon equal measures of grain.*

We also find that 100 lbs. of wheat, No. 3, makes $80\frac{40}{43}$ lbs. of flour, while 100 lbs. of No. 5 yields $72\frac{196}{207}$ lbs.—shewing an advantage of 7.984, or nearly 8 per cent., in favour of No. 3 upon *equal weights* of wheat.

To those who are acquainted with Mr Hardcastle it will be unnecessary to say, that neither ignorance nor design produced these results. And, when I state that he devoted his attention for several hours, and a portion of his machinery, to the exclusive trial of these wheats, it will be of little use to add (though such was the fact) that every operation was conducted under my own eye, and that each parcel underwent an exactly similar process. Indeed, I must say that Mr H. entered into the investigation with a spirit fully equal to my own, and conducted it with a skill that left me nothing to do but to thank him. And surprising as the results of this investigation may appear—surprising as they appeared to me —I must give Mr Hardcastle credit for anticipating them in some degree; for, before the operation of grinding was concluded, he expressed to me his pleasure at being chosen to carry out an experiment of such interest; "as a mark of which interest," added he, "I have no hesitation in saying, (and my opinion is confirmed by the senses of a practical miller—the sight, hearing, and touch)—that No. 5, the ripest wheat, grinds the worst—worse even than the greenest; a fact which few would believe unless they saw."

The results, as we have seen, fully confirmed Mr H.'s opinion; and further examination explained the whole matter. In No. 5 we found a much greater quantity of flinty particles, which would not pass through the flour-sieve, than in any other; a fact which clearly explained why it should, in miller's parlance, "grind worst." The deficiency of No. 5, in yield of flour, when compared with No. 3, was accounted for by the difference in the quantity of the pollard (or sharps), and in the quality of the brans: the bran from No. 5 being coarse and heavy, while that from No. 3 was thin as a bee's wing. "Should a practical miller examine these brans, and be informed that they were from one sort of wheat," remarked Mr Hardcastle at the time, "he would call No. 5 a very common specimen of grinding, and censure the miller; the other he would term a beautiful piece of workmanship, and say that the man who ground it knew how to prepare his machinery; yet the fact is, one miller and one mill have ground and dressed both."

The flour from the various wheats Mr Hardcastle declared to be worth, at that time, 2s. 6d. per stone wholesale. The pollard he valued at 1s. 3d.; and the bran at 10d. per stone. Taking the straw at 2d. per stone, the real value of the respective cuttings will stand thus:—

No. 1.

8 st. 12 lbs. of flour, at 2s. 6d. per stone, . .	L.1	2	1½
12 lbs. of pollard, at 1s. 3d.	0	1	0¼
2 st. 1 lb. of bran, at 10d.	0	1	8½
22½ st. of straw, at 2d.	0	3	9
Total value of the produce of 20 perches, .	L.1	8	7¼

No. 2.

8 st. 6 lb. of flour, at 2s. 6d. per stone,	L.1	1	0¾
11 lb. of pollard, at 1s. 3d.	0	0	11¾
1 st. 11 lb. of bran, at 10d.	0	1	5¾
21 st. 3 lb. of straw, at 2d.	0	3	6½
Total,	L.1	7	0½

No. 3.

12 st. 6 lb. of flour, at 2s. 6d. per stone.	L.1	11	0¾
12 lb. of pollard. at 1s. 3d.	0	1	0¾
2 st. 1 lb. of bran, at 10d.	0	1	8¾
20 st. 8 lb. of straw, at 2d.	0	3	5
Total,	L.1	17	3

No. 4.

12 st. 3 lb. of flour, at 2s. 6d. per stone.	L.1	10	6½
1 st. 3 lb. of pollard, at 1s. 3d.	0	1	6
2 st. 5 lb. of bran, at 10d.	0	1	11½
19 st. 2 lb. of straw, at 2d.	0	3	2¼
Total,	L.1	17	2

No. 5.

10 st. 11 lb. of flour, at 2s. 6d. per stone,	L.1	6	11½
1 st. 9 lb. of pollard, at 1s. 3d.	0	2	0½
2 st 5 lb. of bran, at 10d.	0	1	11½
18 st. of straw, at 2d.	0	3	0
Total,	L.1	13	11½

Giving for the value of an acre of

No. 1.—cut a month before fully ripe,	L.11	9	2
No. 2.—do. three weeks,	10	16	4
No. 3.—do. a fortnight,	14	18	0
No. 4.—do. ten days,	14	17	4
No. 5.—do. ripe,	13	11	8

The loss, therefore, upon the green plots is respectively L.2 : 2 : 6 and L.2 : 15 : 4 per acre; and the gain upon the plots (3 and 4) cut raw respectively L.1 : 6 : 4 and L.1 : 5 : 8 per acre, when compared with the ripe. It will be observed here, that the loss upon No. 2 is greater than upon No. 1, which arises from the former being less in quantity than the latter. But the grain of No. 2 was bolder, and a better sample than No. 1. We have seen from the foregoing tables that it also made more flour to the bushel than No. 1; it will therefore appear strange that the produce should not be equal, at least, to that of the other. In reply to this I would say, that it is scarcely possible to select two plots of ground, the produce from which will be equal in all respects; and therefore a slight variation in the produce may, in any case, be accounted for. In this case, however, another cause operated, I have no doubt, in producing the apparently anomalous result. Thus, owing to the plots of ground being reaped before any other in the neighbourhood, they were, in spite of all precaution, robbed to some extent by the birds. Indeed, I have no doubt but that the loss upon the two cuttings 1 and 2 (especially upon the latter), would have been much less but for this circumstance; for though the desiccation or shrinking of the grain, from being cut too early, undoubtedly caused the quantity by measure of each to be less than that of the later cut samples, it could not, in my opinion, cause a difference of a bushel in 20 perches; nor could it have caused the measure of No. 2 to be less than that of No. 1—a far smaller sample.

In order, therefore, to see how much of the deficiency in measure was to be attributed to the shrinking of the grain by drying, and how much to the other accidental circumstances, I took a long glass tube—sealed at the bottom—of ½-inch diameter, and partially filled it with water. Having made a mark on the glass at the point where the water reached, I made another some distance upwards. After this I poured grains of wheat from the sample No. 1 until the water's edge touched the top mark. The tube was then emptied, and a similar operation performed with all the samples.

From this I found that it required 1110 grains of No. 1, 1005 of No. 2, and 910 of No. 5, to fill the tube so far that the water rose to the top mark. Between Nos. 3, 4, and 5, I could not, after several trials, find any real difference—the variation scarcely ever exceeding 1 per cent., and that in favour first of one sample and then another.

From the foregoing test, however, we learn that, supposing the number of grains upon each portion to be originally the same, $\frac{1}{1110}$, $\frac{1}{1005}$, and $\frac{1}{910}$, will represent the comparative measures or spaces occupied by the produce of Nos. 1, 2, and 5 respectively ; whence—

$\frac{1}{516}$: $\frac{1}{1116}$: : $3\frac{1}{2}$ bushels : 2.86 bushels, the produce of No. 1. And
$\frac{1}{516}$: $\frac{1}{1005}$: : $3\frac{1}{2}$ bushels : 3.16 bushels, the produce of No. 2.

Now, the value of the flour, bran, and pollard, of $2\frac{3}{4}$ bushels of No. 1 was found to be L.1 : 4 : $10\frac{3}{4}$; therefore, 2.86 bushels give a value of L.1 : 5 : $10\frac{1}{2}$. Similarly, the value of the flour, pollard, and bran of No. 2 was L.1 : 3 : $6\frac{1}{4}$; whence the worth of 3.16 bushels is L.1 : 9 : $8\frac{3}{4}$. To these values of Nos. 1 and 2, add respectively 3s. 9d. and 3s. $6\frac{1}{4}$d., the value of the straw from each, and we have for estimated produce of 20 perches of No. 1, L.1 : 9 : $7\frac{1}{2}$; and of No. 2, L.1 : 13 : 3.

The following will therefore be as correct an approximation of the values of the acre cut at the times stated, as it is possible to come at :—

No. 1, quite green,	L.11	17	0
No. 2, green,	13	6	0
No. 3, raw,	14	18	0
No. 4, not quite so raw.	14	17	4
No. 5, ripe,	13	11	8

Shewing a loss of L.1 : 14 : 8 per acre upon No. 1, as compared with No. 5 ; a loss of 5s. 8d. per acre upon No. 2, do. do. ; and a gain of L.1 : 6 : 4 per acre upon No. 3, as compared with the ripe, and of L.3, 1s. per acre, as compared with the green cut No. 1.

Let me here observe, that much as the advantage is on the side of the raw (No. 3) wheat, it would, I have no doubt, have been somewhat more, had not the sheaves been subject, in a slighter degree than Nos. 1 and 2, to the pillage of the birds. For although No. 3 produced as much in measure as No. 5, it is reasonable to suppose that it should have *produced more*, as the waste caused by reaping and stacking the ripe was much greater than that made in harvesting the raw cut wheat. And in so small a number of shocks, a very few visits from the winged legions were sufficient to carry away more than was wasted of No. 5. But this is of no import : With the yield alike, the advantage of No. 3 over the ripe is striking enough. It is an advantage gained not in *any point open to variation* or uncertainty : it is not a superiority merely in *gross quantity* of produce, which many things might have tended to produce; but a superiority in the *quality* of the article produced—a better adaptation of the grain to make flour, and that to an extent by no means trifling. Thus, from data already given, we can clearly shew that, by wheat being cut raw, we have a gain of $15\frac{1}{7}$ per cent. compared with ripe, of flour, *upon equal measures*; and a gain in the weight of straw of 14 per cent.; advantages which afford us a clear gain of $52\frac{4}{7}$ lb. of flour upon every quarter of wheat.

A gain of 7s. 4¾d. in the value of every quarter of wheat.

A gain of 7s. 6¼d. in the value of every quarter of wheat, and the straw producing it.

A gain of L.1 : 6 : 4 upon every acre producing 28 bushels, and of L.1 : 8 : 2½ upon every acre producing 30 bushels; the quantity assumed as the basis of my calculations in my former experiment.

But there are other advantages arising from the early reaping, which, though they cannot be estimated by pounds, shillings, and pence, are not the less valuable. And although I discussed them at some length in my former paper, they are of too great importance in my eye to be omitted or slurred over in the least, when it is in our power to afford further evidence or practical illustration of their value.

For the sake of brevity, these advantages may be thus epitomised. With an additional quantity of flour and straw, already considered, we have *a better quality of both*, a better *chance of securing them*, and a *saving in securing them*.

Thus, the quality of flour as an article of food, and its power of affording nutrition to the body, are universally allowed to depend upon the quantity of gluten it contains.* Indeed, "it seems pretty well ascertained," says Professor Johnston, "that those varieties of grain which contain the largest amount of gluten yield *also* the *greatest return of flour*."

Now, No. 3 here yields a greater return of flour than No. 5; it ought, therefore, to contain the greater proportion of gluten. And such is the case. My own analysis of the flours, in their dry state, gave to the raw sample an advantage of 1¼ per cent.

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* Davy's Agr. Chem., sect. 3; Johnston's Lectures on Agr. Chem. and Geol., &c. &c.

in weight of gluten. In order to test the matter further, I forwarded the samples to Professor Johnston, who favoured me with an analysis. In their *ordinary state of moisture*, he found them to contain respectively—

No. 3, ...	9.15 per cent. of gluten.
No. 5, ...	8.9 ... ...

Thus proving the statement that the wheats which give *the most flour give the best flour.* And, although the farmer may not think much of this slight advantage in point of nutritive quality, it is no less a benefit both to the consumer and the producer,—affording to the former more nutritive matter for the same money, and enabling the latter to enjoy the profit of quantity and quality combined.

That the straw of early cut wheat is of a better quality than that of the ripe, I fully proved in my former paper; and I need only refer to the same authorities. Indeed, the researches of every analyst prove, that the nutriment of plants consists in the soluble matter, that the greatest proportion of this soluble matter is present after the first flowering, and that at this time the plant is most digestible, and consequently most nutritive. But this is a fact which the most pragmatical farmer will not dispute. He knows that if he permits his hay to become too dry it loses a great portion of its excellence, and that if he would have a fat horse and rich manure heap his hay must look green. But indeed the case is without question. If we allow the soluble matter in the straw to be evolved, along with the water, by the action of the atmosphere, and washed away with the rains (for it is soluble, we should remember, and, *after vegetation has ceased*, is easily extracted), we lose that portion of the food which gives strength and flesh to the animal, and food to vegetable life when the straw is converted to manure.

But, indeed, it is impossible to put the case in clearer point of view than it is done by Professor Johnston, to whom I have had the pleasure of communicating the results of my experiments. "The period," says he, "at which hay is cut, or corn reaped, materially affects the quantity (by weight) and quality of the produce. It is commonly known that when radishes are left too long in the ground they become hard and woody—that the soft stem of the young cabbage undergoes a similar change as the plant grows old—and that the artichoke becomes tough and uneatable if left too long uncut. The same natural change goes on in the grasses which are cut for hay. In the blades and stems of the young grasses there is much sugar, which, as they grow up, is gradually changed, first into starch, and then into woody fibre. The more completely the latter change is effected—that is, the riper the plant becomes, the less sugar and starch, both soluble substances, they contain. And though it has been ascertained that the woody fibre is not wholly indigestible, but that the cow, for example, can appropriate a portion of it for food as it passes through her stomach; yet the reader will readily imagine that those parts of the food which dissolve most easily are also likely—other things being equal—to be most nourishing to the animal. It is ascertained, also, that the weight of hay or straw reaped is actually less when allowed to become fully ripe; and therefore, by cutting soon after the plant has attained its greatest height, a larger quantity as well as a better quality of hay will be obtained, while the land also will be less exhausted. The same remarks apply to crops of corn,—both to the straw and to the grain they yield. The rawer the crop is cut, the heavier and the more nourishing the straw. Within three weeks of being fully ripe, the straw begins to diminish in weight, and the longer it remains uncut after that time the lighter it becomes and the less nourishing. On the other hand, the ear, which is sweet and milky a month before it is ripe, gradually consolidates, the sugar changing into starch, and the milk thickening into the gluten and albumen of the flour. As soon as this change is nearly completed, or about a fortnight before ripening, the grain contains the largest proportion of starch and gluten; if reaped at this time, the bushel will be heavier, and will yield the largest quantity of fine flour and the least bran. At this period the grain has a thin skin, and hence the small quantity of bran. But if the crop be still left uncut, the next natural step in the ripening process is to cover the grain with a better protection, a thicker skin. A portion of the starch of the grain is changed into woody fibre, precisely as in the ripening of hay, of the soft shoots of the dog-rose, and of the roots of the common radish. By this change, therefore, the quantity of starch is lessened and the weight of husk increased; hence the diminished yield of flour, and the increased produce of bran. Theory and experience therefore indicate about a fortnight before full ripening as the most proper time for cutting corn. The skin is then thinner, the grain fuller, the bushel heavier, the yield of flour greater, the quantity of bran less; while at the same time the straw is heavier, and contains more soluble matter than when it is left uncut until it is considered to be fully ripe."*

After this, I need only add, that, if my labours have had any share in calling the attention of the Professor to this subject,—should the result be nothing more than so novel a feature in a work on agricultural chemistry as this chapter "On the influence of the time of cutting on the quantity and quality of the produce,"—they have done better service to the cause than ever I anticipated, and have called into the field an auxiliary capable of bearing the whole brunt of the battle.

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* Elements of Agricultural Chemistry and Geology. p. 211.

The better chance of securing the crop, and the saving in securing it, I allude to now merely to give practical corroboration to some of my previous arguments. Thus, in my last paper on this subject, I said—"The saving is self-evident. We gain a fortnight at the commencement of harvest. If the weather be good, we can secure a great portion of our wheat before we should scarcely have begun upon the old system. If not, we can wait so, under any circumstances our chances of securing the grain must be greater. . .

"If we look, too, at the later harvests, we shall, I venture to say, find that, in nine cases out of ten, the grain which was cut *first* was secured in the best condition. As an example of this, the crop of 1839 will suffice. The crops were backward, the harvest the same, and the result was, that, in the north of England, full 75 per cent. of the whole wheat crop was damaged; and full 75 per cent. of that which was uninjured, I will also venture to say, was that which was cut the first. . . .

"The frequent occurrence of such years as this will teach the value of even a fortnight, better than anything that can be said here. And that they will occur again, is beyond a doubt. What has happened *once, may* happen again; but what has happened frequently (as this sort of harvest has), with the same causes in operation, we are warranted in saying will happen again and *often*."

And it has already happened—happened, too, during last harvest. Thus, several fields of wheat in this parish were injured by the weather,—several, too, were cut raw; yet in no one case was an early-reaped crop injured in the slightest degree. So much for the value of a fortnight. One farmer, a near relation of mine, cut a field of the "downy Kent" wheat extremely early, and when he was stacking it, it was remarked, that he had "cut grass and stacked muck;" yet, *mirabile dictu!* the crop (which was a light one), when thrashed, yielded more by four bushels to the acre than ever it was valued at, and was sold for the *very highest price in the market*.

As regards the economy in securing the crop, there is one most important saving, which, independent of the saving effected by the regular servants of the farm performing a greater proportion of the work (from the period of harvest being extended), by commencing early,—setting aside the saving from there being no shaking or waste of grain by winds or by harvesting, is especially worthy of illustration. In my last I thus alluded to it: "The wheat, barley, and oats are often ripe at one time, and aware, as the farmer is, of the injury which strong winds and showers would do them, he has to hunt up labourers at any price. And after all this extra expense, it is extremely probable that, having the whole of his harvest upon his hands at once, he is compelled to let some part of his grain *have too little weather, and some too much.*"

"By commencing his wheat harvest a fortnight earlier, these evils would have been prevented; by the time that his barley and oats were ready, most or all of his wheat would have been cut, and some fit for the stack, and that, too, by the exertions of his regular workmen only. And, being neither pressed for time nor labourers, his harvest would have been finished at a less expense, and his grain secured very probably in a much better condition." Need we confirmation of the truth of both these cases? I can give it. What was hypothesis, is now positive fact. Thus I can point out a farm, within a hundred miles of this place, upon which full three-fourths of all the crops were injured, during last harvest, owing to the reasons I have before stated, and another immediately adjacent to the former, upon which not a single grain was destroyed or discoloured. And this contrast was solely owing to the different use which was made of the fine weather at the beginning of harvest. An extract from a letter written to a friend in America at the end of harvest, will explain this.* I then said, "the harvest is now (1st October) over in this part of the country, and I am happy in being able to say that it has been a favourable one to those who were as stirring as they ought to be. A fortnight of rain, which has only enabled the late farmers to secure their crops a few days ago, has injured some little wheat, and much barley and oats. And had I a season to point out to corroborate my former remarks on the value of the time we gain by beginning our wheat harvest early, I could not find one that would do it so well as the present one; nor could I find a better illustration of "the better chance of securing the crop, &c." (which I stated was given us by cutting early), than is afforded in this immediate neighbourhood. Thus, on a certain farm, the wheat, which was rather backward, was cut in a raw state, the first result of which was, that it was safely housed before the wheat on some farms in the vicinity was reaped. But this was only the beginning of the end (to use a Gallicism). The wheat cutting being over early, the barley and oats were cut down, and consequently secured, in a much shorter time than they would if the wheat had been left to get ripe; in fact, the whole of the "white corn" was secured in fine condition before the rainy weather began; while, upon many lands where the corn was in an equally forward condition, *some wheat, and much of the spring corn, has been damaged.* Such would have been the case in the above instance, if the fine weather at the beginning of harvest had not been made use of."

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* *Vide* "The Cultivator," Albany, U. S., vol. viii. No. 12.

Such, then, is the value of even a short fortnight. In a climate like this, if we do not "seize the moments as they fly," we must pay for our irresolution. If we take time by the forelock when the weather is propitious, we secure to ourselves advantages, the value of which no farmer can fail to appreciate, and should it be unfavourable, we can wait till the sun does shine. In the other case, however, if we neglect to work while it is day, the night comes on—if we miss the sunshine, we have to work in the shower; for we have then no alternative—no *dernier resort*, but must take the season as it chances to come.

It was my intention to have added to my own experiment the testimony of several gentlemen from whom I have received statements supplying practical corroborations of these views and opinions. Neither time nor space will, however, permit me to detail the particulars of one-half of those which have been afforded me by friends in Yorkshire, much less of those which I have received from other counties, and from the United States and British America. I have, therefore, only to express my obligations to these gentlemen for their prompt corroboration. To those, both abroad and at home, whose evidence has already been given to the public through the press, I am especially indebted. One testimony, however, I shall be excused in offering; for coming, as it does, not from an individual but from a body of farmers—and that body organized for the especial consideration of questions on agricultural science—it contains the sum and substance of all that can be offered.

Thus, at the fourth meeting for 1841 of the Leominster Farmers' Club, "the proper time of reaping wheat" was taken into consideration, when it was resolved—"That the corn should be in a raw state, or when the straw, which at a distance may appear green, but when closely examined is found to be approximating to yellow, and the grain itself, when separated, is soft and pulpy, but not in a milky state."

And that the advantages of this method are—

"1*st*, That a *greater weight* of corn is afforded, and that it is of a *very superior quality*.

2*d*, That the straw contains *more nutritive* matter.

3*d*, That there is a *better chance* of securing the crop, and a saving in doing so." (*Vide* Farmer's Mag., July 1842).

Let me here observe, that the above resolution is not merely *in accordance* with my published opinion, but is stated nearly in the *exact words* I used (*Vide* Quar. Journ. of Agric., June 1841, p. 25); while the advantages assigned to the practice of early reaping are the *very same that I* have urged and now contend for. It is impossible that I can supply any stronger corroboration than this. A jury of practical men—men whose every-day occupation has supplied them with the data from which to reason—have sat in judgment on the question, and the decision which they give is in accordance with my own.

Any further testimony would be useless. The inquiring mind can, from what has been stated, draw its own conclusions; while to the "Goodenoughs" (to use Miss Edgworth's nomenclature) of the agricultural world, everything which has been said, or can be said, if it should militate against their preconceived notions, is but *brutum fulmen—vox et preterea nihil.*

Now, it is an old saying, which poets have sung and philosophers proclaimed for ages, that "experience teaches"; but I am afraid that it has seldom been considered that it sometimes teaches evil as well as good. It allows error sometimes to flourish till truth cannot gain root; for if he who has travelled the road for some time misses the nearest way, it is seldom, indeed, that he will permit another to point it out.

An amusing illustration of the truth of this occurred to a friend of mine a few weeks ago. Conversing in a public room upon the subject of early reaping wheat, a representative of the class I have alluded to above (one of those in whose minds that which they *ought to know* is so confounded with what they do know, that that which appears new to them they consider cannot be true), took up the cudgels against my friend, and declared, that "he would never believe such nonsense; he had been a farmer before I was born, and, as he always had allowed his wheat to become ripe, nobody should make him do otherwise."

Such strong resolves, based upon such weighty reasons, my poor friend could not hope to controvert—he was, therefore, silent. His opponent, however, was one of those who endeavour to make the most of a victory (?)—one who, as Horace says, "Fœnum habet in cornu, &c.," he therefore followed up his declaration by an *ad captandum* appeal—adding that "the very idea was unnatural, and was as nonsensical as to say, that *green gooseberries were better than ripe ones.*" To this, my friend, who was not disposed to let fallacious sophistry pass current for argument, though he had not replied to dogmatic assertion, begged to observe, that he could not question the experience of the gentleman, or inquire the use he had made of it; that was perfectly evident! If, however, forty seed-times and forty harvests had taught him *much*, there were some things which he had *failed to remember*, viz.—

1*st*, That fruit was not grain, and therefore there was no analogy between the gooseberry and wheat—whence the fact of one being better for use in a certain condition, was no reason that the other should require to be in that self same state.

2*d*, That, even admitting the analogy, the argument was against him, for gooseberries were actually better for many uses unripe than ripe—were in fact seldom allowed to be dead ripe; it was, consequently, perfectly consistent that wheat should be better for flour when taken raw than when ripe.

3*d*, That, even admitting both his assumptions,—allowing, for sake of argument, that there was a clear analogy between the gooseberry and grain, and that the former was best for all uses when perfectly ripe,—the argument was still more against him; for, as it was a fact which all writers on vegetable physiology allowed, that if he would reap wheat when it was in a condition most nearly assimilated to ripe fruit, that time would be when the ear was green—since it then contained the greatest proportion of sugar. This was explained by the circumstance that the process of ripening produced the very opposite results in the two. Thus, during ripening, the acid in the gooseberry became converted into sugar; while in wheat, during the same process, the sugar which it contained when in bloom gradually changed into starch. It was obvious, therefore, if we would have them both in the same condition, it would be when wheat was green, as they both contained at that time the most sugar.

4th, That, setting aside all analogous evidence—setting aside the fact that hay, straw, turnips, carrots, the cabbage, the artichoke, &c., lose their soluble and nutritive matter, and became tough and dry if left uncut, after they have reached a certain size—direct evidence had been produced that wheat actually deteriorated in value by being left uncut till thoroughly ripe—which direct evidence the gentleman could not controvert; for, by his own assertion, he never had and never would reap his wheat before it was ripe. He had never tested the subject by trial; his experience, therefore, could never refute the experience of another.

Lastly, He begged to remind him that the best interpretation of the word "ripe," was "fitness," and the best farmer was he who reaped his produce as soon as it was fit for use, and who considered it fit when it made the most money in the market.

To this the man of experience (?) rejoined, that he might say what he liked and quote whom he liked, men could write what they liked, and he should believe what he liked! My friend now begged that he would not suppose that he intended to interfere with that determination—it was perfectly consistent with his argument and experience; and he trusted that he would be equally consistent in practice, and eat his asparagus when it was ripe!

It will, perhaps, be said that these cases are few and far between. I hope they are so. This, however, I do know, that he who endeavours to alter or amend in the least the practice which common custom sanctions, will meet with such cases. But this is no very heavy blow. If a few oppose blindly, many are ready to receive with open ears, while this very opposition, though backed by half a century of one-sided experience, does the cause some service. It teaches us to reflect, that if experience does not make all men physicians, it is necessary to keep a look out lest it make us fools.

I have now but one observation to make on the subject, and though it comes last, it is far from being least worthy of attention. It is, that however little, or however much, we may think of the gain to ourselves accruing from the adoption of any system, it is our duty, as members of society, to avail ourselves of every means of applying the resources the Almighty has given to the use of his creatures, and of developing still further those resources for the benefit of the community at large.

When, then, we consider that there are in England and Scotland about 4,000,000 acres of wheat grown annually, producing 12,000,000 quarters of grain, of which three-fourths are allowed to become too ripe—when we consider, that, by cutting this sooner, we should produce an increase of 15⅐ per cent. of flour, and realize an increased value of 7s. 6¼d. upon each quarter produced; and that we should produce food for 1,362,857 persons over and above what we now produce, and an extra annual income of L.512,491; and when we consider that this income would be so much added to the wealth of the country, that it is equal to the proceeds (at 3 per cent.) of an estate worth L.17,083,033, and that the increase of our population demands an increased supply of food, I would ask, what is our duty in this case? The answer I leave.

ACCOUNT OF THE GREAT SHOW OF THE HIGHLAND AND AGRICULTURAL SOCIETY AT EDINBURGH, IN AUGUST 1842.

THE great Annual Show of the Highland and Agricultural Society was held this year, 1842, at Edinburgh, on Monday, Tuesday, and Wednesday, the 1st, 2d, and 3d August. The first day, Monday, was occupied with the exhibition of butter, cheese, wool, seeds, plants, and implements, the premiums for which being awarded on that day, left less work to be done amidst the unavoidable bustle of the succeeding one. Tuesday was devoted to the great exhibition of live stock of all descriptions. The articles of the preceding day were also retained for exhibition both on this and the succeeding one; and on Wednesday, the stock that had obtained premiums were exhibited again for more minute inspection, together with those whose owners were disposed to part with by public sale.

The site chosen for the show was very picturesque, occupying about 8 acres imperial, at the north-west corner of Burntsfield Park, belonging to Sir George Warrender, Bart., immediately adjoining the common called Burntsfield Links. The show-yard was enclosed with boards, against which were the stalls placed to contain the horses and cattle. The sheep were accommodated in pens of hurdles, erected in convenient parts of the ground; and the swine were accommodated in suitable enclosures. Abundance of water was provided in tanks for the stock. The implements occupied the circumferences of two concentric three-quarter circles in the middle of the ground, and on the centre of which circles stood the seat for supplying breakfast to the members of committee, who had to fulfil their respective duties at an early hour of the morning. The shed containing the butter, cheese, wool, seeds, and plants, divided one portion of the sheep from the swine, and stood a little to the north of the implements; whilst the stage, over which the prize-stock passed in review, occupied the chord of the three-quarter circles of implements, immediately in front of the gallery devoted to the accommodation of the ladies. All the stock, implements, and produce were admitted by three gates, and the public by three doors; but the crowd proved so large that they were found almost inadequate to the purpose. Such an occurrence never happened before, even when the show was near a large town; and it suggests the idea of having a gate for those who want to go out. There was a quiet and pleasant entrance afforded to the ladies by the kindness of the Earl of Glasgow, through the picturesque grounds of Burntsfield House. In the neighbourhood of such a locality, with the stately trees of Burntsfield Parks along the west and north sides of the enclosure, together with the undulating nature of the ground, rendered this one of the most sheltered and picturesque sites that was ever appropriated for the Society's shows. The fitting up of the show-yard was planned by, and was placed under the immediate superintendence of, Mr Slight, and gave general satisfaction. The contractor for erecting it was Mr Sidey, Lothian Road.

The time chosen for the exhibition was unusual; and it was so chosen, we believe, by the local committee to suit local circumstances. In some respects, August is a better period of the year for a show of stock than October, but in other respects it is not so. It is better, inasmuch as bulls, cows, and stallions are not so much made up in condition for the occasion, and of course are in a more natural state of body and spirit; but it is not so good for tups and ewes, and fat stock, and quite unsuited for all sorts of farm produce. In most respects, we conceive that spring is the best season for a cattle show, at the end of April or beginning of May. Then bulls and stallions are naturally in high heart, cows in full milk, ewes have their lambs at foot, mares shew unequivocal symptoms of being in foal or barren, fat stock of all kinds are in fine condition, and none but tups are in the dull season, though then fat enough, and most of the farm produce may be exhibited in perfection. We say *may* be, for it is true that at that time white turnips are out of season, though they might be preserved for the purpose; and although sheaves of corn do not look so well when taken out of a stack as off the field, the specimens of such intended to be shewn could be easily preserved from the light in canvass bags, and hung up by the stubble end from the balks of the granary. One objection might be urged against the Society holding their great show in spring, when all the local agricultural societies hold their spring shows; but were that period fixed on by the Society, the local shows could be held immediately after it; and the districts in which the Society's prize bulls and stallions had to serve would not then require to supply themselves with those species of stock, and thereby save the premiums for them. This hint might be considered by the local committee of management at Dundee, and there the experiment of the suggested change might first be tried.

We may here notice some suggestions which we heard publicly made on the ground, in regard to a change in the constitution of these shows of the Society, without the risk of anticipating any discussion they may give rise to in the proper quarter. One suggestion is, that they should be held once in three years, instead of every year. The effect of such a postponement would, we conceive, be to damp the ardour of local districts in preparing stock for the Society's shows when they were held, even although additional aid were given by the Society to local agricultural societies; for should the country comprehend eight or nine districts, in regard to these shows, which it has hitherto done, a period of twenty-four or twenty-seven years would elapse ere they revisited the same district —much too long a period, in our estimation, for any stimulus to have effect. It has also been proposed to divide the country into districts, and visit them in order, as the Royal English Society has determined on doing; but such a plan would virtually defeat the principle upon which the Highland Society now holds these shows. Time was when the Society *invited* the agriculturists of the country to follow them in their peregrinations throughout the country; and the invitations were so cordially accepted, that it was felt that there was no need of repeating them; on the contrary, the Society now goes where *it is invited* by any district. The immediate effect of the position thus taken by the Society is, that should failure anywhere now occur, the responsibility rests with the local committee who conduct all the details. The fixing of districts by the Society would again invest them with responsibility; and a show might be fixed in a district in its turn, which would not be prepared with its stock to present a creditable appearance. It has been supposed, that the large sum collected for a show, is a heavy burden upon any district, since it is possible that most of the premiums may be carried away by other parts of the country. Such an effect should stimulate the complaining district to endeavour to retain its premiums within its own bounds; but if a large subscription is really felt as a burden in any district, it is in the power of the Society to fix its maximum as well as a minimum amount. From the great success which has attended the present show in Edinburgh,—a success beyond what was expected of a district which is not a breeding one,—it has been suggested to make a triennial show in the metropolis, which might be supported by the inhabitants generally, as well as the agriculturists of the districts. For a similar reason, Glasgow has been pointed out as the second metropolitan position for another triennial show, and the local points fixed at convenient seaports, such as Aberdeen, Berwick, and Dumfries. The show would thus not occur at either of these latter places oftener than once in twelve years. The triennial, or rather perhaps every alternate triennial show at Edinburgh, might be endowed as a *national* one; that is, as many of the prize stock as could be collected from all quarters of the kingdom, might be sent there for the purpose of comparison. Another suggestion is to have the show fixed at Edinburgh and Glasgow, and alternate these with a local one, which would have the effect of making a show at Edinburgh and Glasgow once in every four years, and fixing on Aberdeen, Berwick, and Dumfries for the local shows, a local show could not thus return to the district oftener than once in seven years. One and all of these suggestions deserve the consideration of the agricultural community.

But *revenons à nos moutons*. The business of the meeting began early on Monday morning, by the placing of the butter, cheese, seeds, plants, and implements, in their respective places for the inspection of the Judges, who performed their duties in good time, and the public were afterwards admitted to inspect these articles at one shilling a-head. The fleeces of wool entered for composition had been carefully examined by competent judges a few days before in the Society's Museum. At 12 this day, the General Committee met in the Society's Museum, George IV. Bridge, the Earl of Rosebery in the chair, to appropriate the stock to be inspected to the respective Judges, and to assign to the numerous Sub-Committees the respective duties which they would have to perform on the morrow. The committees consisted of one for placing the stock in their respective stalls, one to attend upon the Judges, one to attend at the ladies' gallery, one to pass the prize stock over the stage, one to collect the money from visitors, one for matters of police, one for selecting animals to have their portraits drawn, &c. At three o'clock, a lecture was delivered in the Museum by Dr Henry R. Madden, Penicuik, " On the state in which the soil should be at the time of depositing the seed in it ;" which was well attended, attentively listened to, suitably illustrated by diagrams, much applauded, and requested to be published at an early period. In compliance with this request, the lecture will be found among the Society's papers in the present number. At six o'clock the committee dined together in the Waterloo Rooms. The duties of the chair were well fulfilled by the Earl of Rosebery, and the vice-chair was occupied by Mr Trotter of Mortonhall, chairman of the local committee. The evening was agreeably spent in a brilliant and fashionable ball in the Assembly Rooms.

On the morning of Tuesday, the committee for placing the stock was in the show-yard by five o'clock, and all the stock were safely lodged in the respective stalls by a little after eight, when the Judges commenced their arduous and responsible labours. The following are the names of the gentlemen appointed Judges :—

I. CATTLE.

Short-Horned Breed.—Mr Wood, Kimbleworth, Durham ; Mr Bartholomew, Goltho, Lincolnshire ; Mr Skipworth, Aylesby, Lincolnshire.

Ayrshire Breed.—Mr Finlay, Lyonston ; Mr R. Carmichael, Raploch Farm, Stirlingshire ; Mr Glen, Hawkhead, Ayrshire ; Mr J. M'Ilraith, Auchinflower, Ayrshire.

Fife, Galloway, Angus, and Aberdeen Polled Breeds.—Mr Crawford, Balbougie, Fifeshire ; Mr Carmichael ; Mr M'Ilraith.

West Highland Breed.—Mr Proctor of Halkerton, Forfarshire ; Mr Lorne Campbell, Roseneath, Argyleshire ; Mr Carmichael.

Any Breed.—Mr Proctor ; Mr Glen and Mr Finlay for dairy cows ; Mr Watson, Keillor, Forfarshire ; Mr Lorne Campbell.

II. HORSES.

Sir John Hope, Bart., of Pinkie ; Mr Wm. Gillespie, Gateside, Douglas, Lanarkshire ; Mr Hunt, Thornington, Northumberland.

III. SHEEP.

Leicester Breed.—Mr Buckley, Normantonhall, Leicestershire ; Mr Grey, Dilston, Northumberland ; Mr Watson.

Cheviot Breed.—Mr Robson, East Keildor, Hexam, Northumberland; Mr Welsh, Earlshaugh, Moffat, Dumfriesshire; Mr Murray, Drochill, Peebleshire.

Blackfaced Breed.—Mr Lorne Campbell; Mr Carmichael; Mr Gillespie.

Southdown Breed.—Mr Jonas Webb, Babraham, Cambridgeshire; Mr Wood, Kimbleworth.

Cross Breeds.—Mr Bartholomew; Mr Wood; Mr Watson; Mr Webb.

IV. SWINE.

Mr Gray; Mr White, Glenesslin.

V. DAIRY PRODUCE.

Mr Dixon, Edinburgh; Mr Richardson, Edinburgh; Mr Smith, Leith; Mr M'Nair, Leith.

VI. WOOL.

Mr Archibald, Alloa; Mr Pringle, Haddington; Mr Paterson, Dalkeith.

VII. EXTRA STOCK.

Sir James Russel of Ashiestiel; Colonel Graham of Mossknow; Mr Millar of Ballumbie; Mr Watson, Keillor.

VIII. IMPLEMENTS.

Professor Low; Sir John Robison; Mr Hunter, of Thurston; Mr Richard Hunter, Edinburgh; Mr Smith, Deanston; Mr White, of Glenesslin. Assisted in certain departments by Mr Hugh Morton and Mr Slight, as these two last were themselves exhibitors.

IX. ROOTS AND SEEDS.

Professor Graham, Edinburgh; Dr Neill, Edinburgh; Professor Balfour, Glasgow.

The live-stock consisted of horses, for coaching as well as agricultural purposes;—of cattle, composed of the Short-horn, Ayrshire, Fife, West Highland, Galloway, Angus, and Aberdeen polled breeds, and of a few crosses between any two of these breeds;—of sheep, consisting of the Leicester, Cheviot, Blackfaced, and Southdown breeds, and a few crosses between any two of them;—and of swine, the breeds of which were not easily distinguishable, but we should say that they were all grafted on the Berkshire breed.

I. HORSES.

Of horses, there were in all, including foals along with their mothers, 179 in number. Of these 148 were entered for competition; and of these again, 133 were for agricultural purposes, and 15 for the breeding of carriage horses. The draught horses, taken as a whole, were good; the stallions were very good, and the mares excellent, so much so, that we do not remember of seeing so many good ones shewn together at any former show of the Society. Of stallions there were 27; of entire colts, foaled after 1st January 1839, 9; after the 1st January 1840, 14; and of colts foaled after 1st January 1841, 6. Of mares there were 41; of fillies, foaled after 1st January 1839, 13; after 1st January 1840, 16; and after 1st January 1841, 7. Of the stallions for breeding carriage horses, there were one or two of good figure and action; but the mares of this class were all of inferior description. The number of the stallions were 6, and of mares 9. The following are the awards in this class of stock:—

For the best Cart Stallion not exceeding ten years—The Premium of Fifty Sovereigns, to No. 15, Messrs R. and T. Jackson of Stanleymuir, county of Renfrew. His pedigree is that he was got by Mr Samuel Clark Manswrae's Sovereign; dam by Mr Fulton's Briton.

For the second best ditto—The Premium of Forty Sovereigns, to No. 20, Mr George Paton, Bankhead, county of Renfrew, for his horse *Briton;* whose pedigree is that he was got by Briton; grandsire Glancer; dam Peggy.

For the third best ditto—The Premium of Thirty Sovereigns, to No. 27, Mr Hugh Wallace, Old Monkland, county of Lanark, for his horse *Glancer;* whose pedigree is that he was got by Mr Frame of Broomfield's Glancer, out of a Clydesdale mare bred by John Sommerville of Braidest.

For the best Stallion for breeding Carriage Horses—The Premium of Fifty Sovereigns, to No. 3, Mr Thomas Cossar, Dalkeith, county of Edinburgh, for his horse *Exceptor;* he was got by Grand Turk, late the property of Messrs J. & B. Weir of Waverton; his dam by the Earl of Lonsdale's Podargus; g. d. by Foxhunter, out of Grey Arabia; g. g. d. by Firelock, out of Calish, by Herod. Grand Turk was got by Goodlass Turk; his dam by Argus Rainbow.

For the best Mare for breeding Carriage Horses—The Premium of Fifteen Sovereigns, to No. 1, the Earl of Hopetoun, county of Linlithgow.

For the second best ditto—The Premium of Ten Sovereigns, to No. 3, Mr Lewis Borthwick, county of Edinburgh.

For the best Cart Mare—The Premium of Fifteen Sovereigns, to No. 14, Mr James Frame, Overtown, county of Lanark.

For the second best ditto—The Premium of Ten Sovereigns, to No. 15, Mr John Gibson, Woolmet, county of Edinburgh.

For the best entire Colt for agricultural purposes, foaled after 1st January 1839—The Premium of Twenty Sovereigns, to No. 2, Mr Samuel Clark, Manswraes, county of Renfrew.

For the best ditto for ditto, foaled after 1st January 1840—The Premium of Ten Sovereigns, to No. 1, Mr Andrew Aitken, Carnbee, county of Fife.

For the best Filly for ditto, foaled after 1st January 1839—The Premium of Five Sovereigns, to No. 8, Mr John Craig, Burnbrae, county of Lanark.

For the best ditto, foaled after 1st January 1840—The Premium of Five

Sovereigns, to No. 14, Mr James Newbigging, Poniel, county of Lanark.

For the best Colt or Filly, foaled after 1st January 1841—The Premium of Five Sovereigns, to No. 13, Mr Christopher Veitch junior, Park, county of Linlithgow.

Of the *Extra Stock in Horses* there were 29 exhibited, comprising 4 Clydesdales, 3 Clevelands, 1 Suffolk, 3 Thorough-breds, 3 Arabs, 1 Shetland and 6 Highland Ponies, and 8 Crosses. For these the Silver Medal was awarded to C. M. Barstow, Esq., for his Arab Stallion, Alexander the Great, seven years' old, apparently a well-bred Arab, having the skin black; and the following were commended, namely, Inheritor, exhibited by W. R. Ramsay, Esq., M.P., and the Little Known, exhibited by D. Robertson, Esq. of Ladykirk. The Judges noted in their award "that the exhibition of horses altogether was of the most superior description, with the exception of mares for breeding carriage horses, which were indifferent."

II. Cattle.

The entire number of cattle exhibited amounted to 295, of which 105 were Short-horns, 106 Ayrshires, 16 Fife, 18 West Highland, 24 polled Galloway, Angus, and Aberdeenshire, 1 Alderney, and 25 crosses between any two of these breeds.

1. *Short-horn Breed.*—The number of short-horns exhibited, including *extras*, amounted to 104. The entire number were good; a few of the bulls were fine animals; the cows excellent, the best show of them that has ever taken place at any of the Society's meetings, which may greatly be ascribed to the favourable period of the year for cows at which this show was held. The heifers were also excellent, and the fat oxen, though few in number, well deserved the premiums awarded to them. The subdivision of this class of stock consisted of bulls, 37, namely, those calved after 1st January 1838, 24, and after the 1st January 1841, 13; of cows, 25; of heifers, 32, namely, those calved after 1st January 1840, 10, and after 1st January 1841, 17; and the best 5, calved after 1st January 1841. Of oxen there were 6. One of the oxen belonging to Mr Robert Dudgeon, Humbie, county of Linlithgow, was recommended by the Judges to have his portrait taken for the Society's Museum. The premiums awarded were the following:—

For the best Bull, calved after 1st January 1838—The Premium of Fifty Sovereigns—to No. 6, Mr Thomas Crofton, Holywell, county of Durham, for his bull named the *Provost*. His pedigree is, he was got by Magnum Bonum, dam Young Cherry by Highflyer, granddam Old Cherry by pirate, g. g. d. by Houghton, g. g. g. d. by Marshal Blucher.

For the second best ditto—The Premium of Thirty Sovereigns—to No. 15, Mr John Hunt, Thornington, county of Northumberland, for his bull named *Guy Faux*. Guy Faux was got by Gainford, his dam by Matchem the Third, his g. dam by Pope, &c. See Herd Book.

The Honorary Silver Medal—to Sheldon Cradock, Esq., the breeder of the best Bull in this class.

For the best Bull, calved after 1st January 1841—The Premium of Twenty Sovereigns—to No. 9, John Millar, Esq. of Ballumbie, county of Forfar, for his bull named the *Earl of Durham*. He was got by Gainford (2844); dam Bersina, by Cripple (1887); g. d. Brilliant, by Snowdrop (2653); g. g. d. by St Albans (1412); g. g. g. d. by Waverley (2819); g. g. g. g. d. by R. Colling's Washington (676).

For the best Cow—The Premium of Fifteen Sovereigns—to No. 2, His Grace the Duke of Buccleuch, county of Edinburgh, for his cow named *Lilywhite*. Lilywhite was got by Thorpe (see Herd Book); dam, Snowdrop, by Whitelaw; g. d. by Mr Robertson's Albion; g. g. d. (Europa) by Sirius, &c. Lilywhite's dam gained the first premium at the Society's General Show at Glasgow in 1838.

For the second best ditto—The Premium of Ten Sovereigns—to No. 3, His Grace the Duke of Buccleuch, county of Edinburgh, for his cow named *Phœbe*. Phœbe was got by Whitelaw; dam by Mr John Rennie's Romulus; g. d. by St Leger; g. g. d. by Comus; g. g. g. d. by Midas, &c.

For the third best ditto—The Premium of Five Sovereigns—to No. 1, His Grace the Duke of Buccleuch, county of Edinburgh, for his cow named *Princess*. Princess was got by Young Studley; dam Kilmeny; g. d. Young Alexina by Pilot; g. g. d. by Warlaby; g. g. g. d. Aques, by Agamemnon; g. g. g. g. d. by Bright Eyes, &c.

For the best Heifer, calved after 1st January 1840—The Premium of Ten Sovereigns—to No. 2, Mr Thomas Crofton, of Holywell, county of Durham, for his heifer named *Melrose*. Melrose was got by Gainford (2044); dam Primrose by Miracle 2d (2322); g. d. Rosebud by Emperor (1974); g. g. d. by Barmpton (1677); g. g. g. d. by St Albans (1412); g. g. g. g. d. by Simon (590); g. g. g. g. g. d. by Pope (514).

For the second best ditto—The Premium of Seven Sovereigns, to No. 5, John Millar, Esq. of Ballumbie, county of Forfar.

For the third best ditto—The Premium of Five Sovereigns, to No. 9, Mr William Tod, Elphingston Tower, county of Haddington.

For the best Heifer, calved after 1st January 1841—The Premium of Ten Sovereigns, to No. 1, His Grace the Duke of Buccleuch, county of Edinburgh. The sire and dam of the Duke of Buccleuch's roan heifer gained the first premiums at the Society's General Show at Aberdeen in 1840.

For the second best ditto—The Premium of Seven Sovereigns, to No. 9, Mr Thomas Crofton, Holywell, county of Durham, for his heifer named *Amelia*. Amelia was got by Gainford (2044); dam Adelaide by Emperor (1974); g. d. Gaudy by Monarch (2326); g. g. d. by Cato (119); g. g. g. d. by Whiteworth (695).

For the third best ditto—The Premium of Five Sovereigns, to No. 5, Mr Barclay Allardice of Ury, county of Kincardine.

For the best two Oxen, calved after 1st January 1839—The Premium of Ten Sovereigns, to No. 1, Mr Robert Dudgeon, Humbie, county of Linlithgow.

For the second best two ditto—The Premium of Seven Sovereigns, to No. 2, Mr Millar of Ballumbie, county of Forfar.

For the best two Oxen, calved after 1st January 1840—The Premium of Ten Sovereigns, to No. 1, Mr John Brodie, Abbeymains, county of Haddington.

2. *Ayrshire Breed.*—The entire exhibition of this kind of stock, comprised 106 head, consisting of 18 bulls, 64 cows, 18 heifers, and 6 oxen. The show of cows was very fine, and much better than at any former show of the Society. The portrait of the cow which obtained the first premium, belonging to Mr William Glasgow, Airdrie, county of Lanark, was recommended to be taken for the Society's Museum. The premiums awarded are as follows:—

For the best Bull calved after 1st January 1838—The Premium of Twenty Sovereigns, to No. 6, Mr James Horn, Newmill, county of Stirling.

For the second best ditto—The Premium of Ten Sovereigns, to No. 12, Mr Robert Paton, Clober Hill, county of Dumbarton.

The Honorary Silver Medal to Mr John Couborough, county of Renfrew, the *Breeder* of the best Bull in this class.

For the best Cow—The premium of Fifteen Sovereigns, to No. 15, Mr William Glasgow, Airdrie, county of Lanark.

For the second best ditto—The premium of Seven Sovereigns, to No. 19, Mr Graham of Limekilns, county of Lanark.

For the third best ditto—The premium of Five Sovereigns, to No. 13, Mr Gabriel Dunlop, Robertland, county of Ayr.

For the best three Cows—The premium of Ten Sovereigns, to No. 2, Mr Lawrence Drew, Carmyle, county of Lanark.

For the best Heifer, calved after 1st January 1840—The premium of Seven Sovereigns, to No. 7, Mr James Newbigging, Poniel, county of Lanark.

For the second best ditto—The premium of Five Sovereigns, to No. 2, Mr Alexander Kerr, Gallowberry, county of Ayr.

For the best two Oxen, calved after 1st January 1838—The premium of Ten Sovereigns, to No. 2, Mr Thomas Sadler, Norton Mains, county of Edinburgh.

3. *Fife Breed.*—There was but a small exhibition of Fife cattle, comprising altogether only 16 animals, namely, 3 bulls, 6 cows, 3 heifers, and 4 oxen. The bull which obtained the first premium, belonging to Mr Wilson, Firthfield, is the finest animal of the breed we have seen for many years. His portrait is to be taken for the Society's Museum. The premiums awarded are as follows:—

For the best Bull, calved after 1st January 1838—The premium of Twenty Sovereigns, to No. 3, Mr Robert Wilson, Firthfield, county of Fife.

The Honorary Silver Medal to Mr Robert Wilson, the *Breeder* of the best Bull in this class.

For the best Cow—The premium of Fifteen Sovereigns, to No. 5, Colonel Lindsay, Balcarres, county of Fife.

For the best Heifer, calved after 1st January 1840—The premium of Seven Sovereigns, to No. 1, Mr Robert E. Beveridge, Urquhart Farm, county of Fife.

For the best two Oxen, calved after 1st January 1838—The premium of Ten Sovereigns, to No. 2, Colonel Lindsay of Balcarres, county of Fife.

4. *West Highland Breed.*—The premiums offered for this beautiful and useful class of cattle were confined to fat stock. The number entered, including *extras*, was only 18. The black ox of Mr Campbell of Jura's pair, No. 2, was a particularly fine animal. The awards were as follows:

For the best two Oxen, calved after 1st January 1838—The premium of Fifteen Sovereigns, to No. 4, Mr Wauchope of Edmonstone, county of Edinburgh.

For the second best two ditto—The premium of Ten Sovereigns to No 1, Sir Neil Menzies of Menzies, Bart., county of Perth.

For the best two Oxen, calved after 1st January 1839—The premium of Ten Sovereigns, to No. 1, his Grace the Duke of Sutherland, county of Sutherland.

5. *Galloway, Angus, and Aberdeen Polled Breeds.* The premiums for these polled breeds were confined entirely to fat stock, of which only 24 were exhibited. The awards were as follows:—

For the best two Oxen, calved after 1st January, 1838—The Premium of Fifteen Sovereigns, to No. 1, Sir John Hall of Dunglass, Bart. county of Berwick. (Aberdeenshire Breed.)

For the second best two ditto—The Premium of Ten Sovereigns, to No. 6, Mr Hugh Watson, Keillor, county of Forfar. (Angus Breed.)

For the third best two ditto—The Premium of Five Sovereigns, to No. 4, Mr Alexander Craig, Kirkton, county of Sutherland. (Galloway Breed.)

For the best two Oxen, calved after 1st January, 1839—The Premium of Fifteen Sovereigns, to No. 1, His Grace the Duke of Richmond, county of Banff. (Aberdeenshire Breed.)

For the second best two ditto—The Premium of Ten Sovereigns, to No. 4, Mr James Mustard, county of Forfar. (Angus Breed.)

6. *Any Breed,* whether pure or cross, and for the best dairy cow. The number submitted to exhibition, including *extras,* was 25; and we may

include the Alderney bull and male Zebu in this class. The animals of this class were all good. The Zebu was brought forth in the Edinburgh Zoological Gardens. The following is the award of the premiums:—

For the best two Oxen, pure or cross, calved after the 1st January 1838 —The Premium of Fifteen Sovereigns, to No. 2, Mr Robert Walker, Ferrygate, county of Haddington.

To No. 1, His Grace the Duke of Buccleuch, county of Edinburgh, the owner of the five best Steers, calved after 1st January 1841, which in the opinion of the Judges, would best remunerate the feeder—Fifteen Sovereigns.

To No. 2, Mr Moubray of Cambus, count of Clackmannan, the owner of the five best Heifers calved after 1st January 1841, which, in the opinion of the Judges, would best remunerate the feeder—Fifteen Sovereigns.

For the best Dairy Cow—The Premium of Ten Sovereigns, to No. 4, Mr James Peattie, Knowhead, county of Stirling.

III. SHEEP.

The exhibition of sheep was less numerous comparatively than that of the horses or the cattle. The total number exhibited was 487, comprising 205 Leicesters, 124 Cheviots, 72 Blackfaced, 25 Southdowns, and 61 crosses between any two of these breeds, but chiefly between the Leicester tup and the Cheviot and Blackfaced ewes, and the total number includes two Chinese sheep imported in 1841 from the northern provinces of China by the Hon. Richard S. Dundas, C. B.

1. *Leicester Breed.*—Of this breed 205 were exhibited, but the Judges expressed their disappointment at the want of merit generally which their appearance indicated. This number was made up of 75 tups, 85 ewes, 30 gimmers, 10 dinmonts, and 5 wethers. The awards were as follows:—

For the best Tup—The Premium of Twenty Sovereigns, to No. 12, Mr James Erskine, Melrose, county of Roxburgh.

For the second best ditto—The Premium of Fifteen Sovereigns, to No. 21, Mr William Mylne, Bolton, county of Haddington.

For the third best ditto—The Premium of Ten Sovereigns, to No. 11, Mr James Burnet, Aberlady, county of Haddington.

For the best Shearing Tup—The Premium of Twenty Sovereigns, to No. 8, Mr John Brodie, Abbey Mains, county of Haddington.

For the second best ditto—Fifteen Sovereigns, to No. 7, Mr John Brodie, Abbey Mains, county of Haddington.

For the third best ditto—The Premium of Ten Sovereigns, to No. 18, Mr Robert Walker, Ferrygate, county of Haddington.

For the best pen of five Ewes—The premium of Ten Sovereigns, to No. 2, Mr George Brown, Halls, county of Haddington.

For the second best ditto—The Premium of Five Sovereigns, to No. 10, Mr Andrew Thompson, Highridgehall, county of Roxburgh.

For the best pen of five Gimmers—The Premium of Ten Sovereigns, to No. 3, Mr George Brown, Halls, county of Haddington.

For the second best ditto—The Premium of Five Sovereigns, to No. 6, Mr George Reid, Ballencrieff, county of Haddington.

For the best pen of five Dinmonts—The Premium of Five Sovereigns was not awarded in this Class.

2. *Cheviot Breed.*—The number exhibited was 124, comprising 39 tups, 30 ewes, 35 gimmers, 10 dinmonts, and 10 wethers. The lot of wethers belonging to Mr Craig, Bighouse, in Sutherlandshire, were excellent and the portrait of one of them was recommended to be taken for the Society's Museum. The awards were as follows:—

For the best Tup—The Premium of Fifteen Sovereigns, to No. 12, Mr Alexander Craig, Bighouse, county of Sutherland.

For the second best ditto—The Premium of Ten Sovereigns, to No. 6. Mr William Aitchison, Menzion, county of Peebles.

For the third best ditto—The Premium of Five Sovereigns, to No. 14, Mr Thomas Elliot, Hindhope, county of Roxburgh.

For the best Shearling Tup—The Premium of Ten Sovereigns, to No. 12, Mr William Riddell, Cappuck, county of Roxburgh.

For the second best ditto—The Premium of Five Sovereigns, to No. 4, Mr Alexander Craig, Bighouse, county of Sutherland.

For the best pen of five Ewes—The Premium of Ten Sovereigns, to No. 1, Mr William Aitchison, Menzion, county of Peebles.

For the second best ditto—The Premium of Five Sovereigns, to No. 3, Mr James Brydon, Moodlaw, county of Dumfries.

For the best pen of five Gimmers—The Premium of Ten Sovereigns, to No. 4, Mr Alexander Craig, Bighouse, county of Sutherland.

For the second best ditto—The Premium of Five Sovereigns, to No. 1, Mr William Aitchison, Menzion, county of Peebles.

For the best five fat Wethers, lambed in 1839—The Premium of Five Sovereigns, to No. 1, Mr Alexander Craig, Bighouse, county of Sutherland.

3. *Blackfaced Breed.*—The number exhibited was 72, consisting of 17 tups, 20 ewes, and 35 wethers. The awards were as follows:—

For the best Tup—The premium of Ten Sovereigns, to No. 4, Mr James Deans, Mitchellhill, county of Peebles.

For the second best ditto—The premium of Five Sovereigns, to No. 8, Mr Robert M'Turk, of Hastingshall, county of Dumfries.

For the best pen of ten Ewes—The premium of Five Sovereigns, to No. 2, Mr Alexander Murray, Dean's Houses, county of Peebles.

For the best five fat Wethers, lambed in 1838—The premium of Five Sovereigns, to No. 4, Mr James A. Vernor, Hillhead, county of Edinburgh.

For the best five ditto, lambed in 1839—The premium of Five Sovereigns, to No. 3, Mr Archibald Whyte, Braedownie, county of Forfar.

4. *Southdown Breed.*—There were only 25 animals of this class exhibited, consisting of 5 tups and 20 ewes; there was no entry of wethers. The awards were as follows:—

For the best Tup—the premium of Fifteen Sovereigns, to No. 4, Mr Hugh Watson, Keillor, county of Forfar.

For the best pen of five Ewes—The premium of Five Sovereigns, to No. 1, His Grace the Duke of Richmond, county of Banff.

5. *Cross-breeds.*—Of these there were 61 animals exhibited, including those in the *extras.* The awards tell the sort of cross for which the premiums were appropriated, and they are as follows:—

For the pen of five Dinmonts, cross between Leicester Tup and Cheviot Ewe—The premium of Five Sovereigns, to No. 2, Mr Robert Waugh, Eweford, county of Haddington.

For the best five Dinmonts, cross between Leicester Tup and Black-faced Ewe—The premium of Five Sovereigns, to No. 1, Mr John Finnie, Swanston, county of Edinburgh.

For the best pen of five Wethers, of any cross, not exceeding four years old—The premium of Five Sovereigns, to No. 1, Mr Aitchison, of Alderston, county of Haddington. This cross was one between the Southdown tup and Leicester ewe.

IV. SWINE.

The number of swine exhibited altogether was 53, comprising 16 boars, 13 sows, 7 of which had pigs, and 21 *extra.* The Judges esteemed the show of swine as highly creditable; and, besides those to whom they awarded premiums, they conceived that No. 3 sow, belonging to the Duke of Buccleuch, as deserving of particular notice, as well as Nos. 2 and 7, among the extra stock, belonging respectively to Mr James Chapman, Dysart, county of Fife, and Mr John Gillon, Leith. The awards were as follows:—

For the best Boar—The premium of Seven Sovereigns, to No. 8, Mr William Henderson, Newmills, county of Clackmannan.

For the second best ditto—The premium of Five Sovereigns, to No. 13, Mr Alexander Scott, Craiglockhart, county of Edinburgh.

For the best Sow—The premium of Five Sovereigns, to No. 7, Mr John Hunter, Beith, county of Ayr.

For the second best ditto—The premium of Four Sovereigns, to No. 6, Mr Alexander Gillespie, Colinton Mill, county of Edinburgh.

V. EXTRA STOCK.

Although we have enumerated the stock entered under this head among the classes to which they respectively belong, it may prove interesting to specify the numbers of each kind of stock which were not entered for competition of the premiums, and all stock so entered are placed in the class of *extra stock*. They amounted in all to 164 animals, comprising 6 bulls, 7 cows and a calf, 3 heifers, 18 oxen, 26 horses, 82 sheep, 21 swine, and 1 zebu. The Judges reported as follows:—First, in the class of Cattle, they recommended a premium of Five Pounds to a six-year old Ayrshire Bull, belonging to Mr Thomas Stark, Mains Farm, Campsie, near Stirling. They also consider of great merit the following—to the owners of each of which has been awarded the Silver Medal—Three short-horned Cows, exhibited by the Duke of Buccleuch; a three-year old short-horned Ox, exhibited by Mr Tyndal Bruce of Falkland; two two-year old Steers, a cross between the short-horned Bull and West Highland Cows, exhibited by Mr Dudgeon of Humbie; a four-year old West Highland Ox, exhibited by Neil Malcolm, Esq. of Poltalloch; two five-year old Oxen of the West Highland breed, exhibited by Mr Trotter of Mortonhall.

For the class of Sheep they commend five two-year old Leicester Wethers, exhibited by the Earl of Wemyss; five three-year old Cheviot Wethers, exhibited by Mr Craig of Bighouse; five three-year old Leicester Ewes, exhibited by Mr Brown of Halls—three Ewes of the Leicester breed, 2 nine and 1 eleven years old, exhibited by Mr Hislop—1 thirteen-year old Ewe, with her 21st Lamb, exhibited by Mr Brown of Halls.

For the class of Horses they commended a Silver Medal for the Arab Stallion, Alexander the Great, 7 years old, exhibited by C. M. Barstow, Esq., apparently a well-bred Arab; for Inheritor, exhibited by W. R. Ramsay, Esq. M.P.; and for The Little Known, exhibited by D. Robertson. Esq. of Ladykirk.

This show thus consisted of 179 horses, 295 cattle, 487 sheep, and 53 swine—making a total of 1014 head of stock; and, viewing them as a whole, they constituted an exhibition very creditable to the breeders, and possessing interest to the spectators.

VI. DAIRY PRODUCE.

The produce of the dairy that was exhibited in competition were neither numerous nor of fine quality, and both defects may be explained by reference to the early period of the season in which the Show was held. As matters stood, 38 lots were entered, consisting of 22 of Butter, and 16 of Cheese; this latter being divided into 12 lots of Full Milk and 4 of Skimmed Milk Cheese. The awards were as follows:—

1. *Curing Butter.*—To the owner of any dairy in Scotland who had made and cured, and exhibited at the Show, the best quality of Butter for the market; the quantity made and cured not being less than two cwt., during the season 1842—The premium of Five Sovereigns, to No. 14, Mr George Sanderson, Orchardfield, county of Edinburgh.

For the second best quality—The premium of Three Sovereigns, to No. 2, Lord Lynedoch, county of Perth.

2. *Making Cheese.*—To the person in Scotland who produced the best specimen of Sweet or Full Milk Cheese, made of any variety that he shall find most profitable for the market, the quantity not being less than one cwt., of 112 lb., 16 oz. to the pound—The premium of Five Sovereigns, to Mr William Hamilton, Persland, county of Lanark.

For the second best quality—The Premium of Three Sovereigns, to Mr Hugh Montgomery, Kilmory, county of Bute.

To the owner of any dairy in Scotland who has made and exhibited for sale the best quality of Cheese from Skimmed Milk, not being less than one cwt., during the season 1842—The premium of Three Sovereigns, to Mr David Sommerville, Strawfrank, county of Lanark.

For the second best quality of ditto—The premium of Two Sovereigns, to Mr John Sommerville, Lampits, county of Lanark.

VII. WOOL.

The competition of Wool was not adjudged in the Show Yard, but in the Society's Museum, on the 27th July, where the fleeces had a much better opportunity of being minutely examined than in the show-yard. After a careful examination, the Judges awarded the premiums as follows:—

1. *Leicester Wool.*—Shearling Leicester Tup Fleece, weight 8 lb. 4 oz. shewing *quality, weight,* and *management;* the first premium of Five Sovereigns was awarded to General Lord Lynedoch, being from No. 97 of his Lordship's flock.

Shearling Leicester Tup Fleece, weight 6 lb. 13 oz., shewing *quality, weight,* and *management;* the second premium of the Silver Medal was awarded to Colonel Miller of Urquhart, Fifeshire.

Shearling Leicester Ewe Fleece, weight 5 lb. 7 oz., shewing *quality, weight,* and *management;* the first premium of Five Sovereigns was awarded to Lord Lynedoch, being from 399 of his Lordship's flock.

Shearling Leicester Ewe Fleece, weight 5 lb. 8½ oz., shewing *quality, weight,* and *management;* the second premium of the Silver Medal was awarded to Mr George Brown, Halls, Dunbar.

Shearling Leicester Tup Fleece, weight 8 lb. 9 oz., having merit as to *washing* and *winding;* the first premium of Five Sovereigns was awarded to Mr George Brown, Halls, Dunbar.

Shearling Leicester Tup Fleece, weight 8 lb 11½ oz., having merit as to *washing* and *winding*; the second premium of the Silver Medal was awarded to the Duke of Buccleuch.

Shearling Leicester Tup Fleece, weight 6 lb. 10¼ oz., having merit on the score of *washing* alone; the first premium of Two Sovereigns was awarded to Mr John Brodie, Abbey Mains, near Haddington.

2. *Cheviot Wool.*—For the specimens of Wool, at the General Competition, which took place at the Society's Museum on the 27th, and afterwards exhibited at the Show; the awards of the prizes were—

Shearling Cheviot Tup Fleece, weight 6 lb. ¼ oz., salved with grease only, the premium of Five Sovereigns was awarded to Mr Thomas Anderson, Sandhope, Selkirkshire.

Shearling Cheviot Ewe Fleece, weight 3 lb. 12¼ oz. salved with grease only, the Silver Medal was awarded to Mr Thomas Elliott, Hindhope, Roxburghshire.

3. *Cross-bred Wool.*—Fleece of a Cross between the Leicester Tup and Shetland Ewe, weight 5 lb. 3 oz., and which the Judges highly commended for quality and management, a premium of Five Sovereigns was awarded to Mr Aitchison, Borlands, Peeblesshire.

Fleece of a cross between the Southdown Tup and Shetland Ewe, weight 4 lb. 4 oz., a premium of Three Sovereigns was awarded to Mr Aitchison, Borlands, Peeblesshire.

4. *Cotswold Wool.*—Cotswold Fleece, weight 15 lb. 3 oz., presented by the Hon. Alexander Leslie Melville of Branston Hall, near Lincoln. This fleece was clipped from one of a pen of 20 Sheep which gained the first prize at the Lincoln Fair in April 1842, and which were bred by Mr Battersby of Scothorn, near Lincoln.

The Hon. Mr Melville also presented a Fleece, lighter and finer, from a yearling Leicester sheep, bred by Mr Charles Tonge of Branston, near Lincoln.

There were exhibited Fleeces of Cheviot and Black-faced Wool, by Mr Robert Boyd, Innerleithen, shewing the results of a new salve.

VIII. Roots and Seeds and Plants.

The Judges reported as follows:—

1. Messrs Lawson and Son exhibited an excellent collection of living grasses, including many rare species, all in a vigorous state, in flower-pots, and interesting both in a botanical and agricultural point of view. To this collection was awarded L.5, or a medal of that value.

2. Mr Robert Arthur, Leith, exhibited a good collection of clovers, including large and vigorous specimens of an early-flowering variety of *Trefolium hybridum.* Ripe seeds of the trefoil, collected this season, were also shewn. In this collection there were likewise large and healthy specimens of *Melelotus leucantha*, var. *major*, or Bokhara clover. This crop was cut in the middle of May, and yielded specimens 8 feet long; and a second crop was gathered on 30th July, 7 feet 6 inches in length. The plants were grown on a sandy soil, near Leith Links. The Silver Medal was awarded to Mr Arthur.

3. A collection of agricultural seeds and grains, by Messrs Drummond and Sons, Stirling, appeared worthy of commendation. There were

specimens of Timothy grass, *Phleum pratense,* grown on the estate of Glenbervie, Stirlingshire, which yielded 320 stones per imperial acre.

4. A valuable set of experiments on grains, made by the Messrs. Drummond, at the suggestion of Mr Stirling of Glenbervie, to shew the effects of sowing at different depths in the soil, deserve to be published in the Society's Transactions.

5. A very large specimen of Bokhara clover, exhibited by Messrs Little and Ballantyne, Carlisle, was considered worthy of particular notice. The Silver Medal awarded.

6. Mr David Roughead, Haddington, exhibited an excellent specimen of perennial rye-grass seed, and very good samples of purple-top Swedish turnip seed, both raised this year near Haddington. The Silver Medal was awarded to Mr Roughead.

7. The turnips exhibited by Messrs Drummond and Mr David Roughead were well formed and advanced for the season; but it need scarcely be added, that the period of the year was much too early for agricultural roots in general. To Messrs Drummond was awarded L.10, or a medal of that value, for the interest exhibited by them in support of the Show, both by the articles just described, and the numerous implements which they brought forward.

The season was too early for the competition in seed wheat; but it will take place in the Society's Museum on Tuesday, 25th October next, when it is hoped that fine samples of white and red wheats of this crop will be shewn in competition.

IX. IMPLEMENTS.

In regard to the implements exhibited, the number was considerably greater than on most former occasions, being 200, and presented for exhibition by 60 individuals. The Judges found it difficult to enter into details connected with so numerous examples of mechanism; and they found it impossible to propose rewards from the funds allotted to this branch in the least degree corresponding with the merits of the inventions, or the expenses incurred by the ingenious artizans who produced them. All that they could, therefore, do was only to advert in general terms to the instruments and machines produced, and to suggest a few premiums, indicating the opinion of the Judges of the relative merits which certain of them possess. The following premiums the Judges propose should be awarded:—To Mr Ebenezer Alexander, Taylorton, near Stirling, for Implements for Cutting Drains—a Silver Medal. To Mr James Ferguson, Bridge of Earn, for an Iron Drain Plough—a Silver Medal. To Mr James Barclay, Morton, Kirknewton, for a Machine for Slicing Turnips, to be worked either with manual labour, or by being attached to a cart—Two and a Half Sovereigns. To Mr John Colton, Athelstaneford, for a Turnip Slicer, to be attached to a cart—Two Sovereigns. To Mr James Kirkwood, agricultural implement maker, Tranent, for a Turnip Slicer, to be attached to a cart—Three Sovereigns. To Mr William Stone, Lawton, near Jedburgh, for a Machine for Cutting Turnips, to be attached to a common cart—Two Sovereigns. To Mr William Blurton, Fieldhall, near Uttoxeter, Staffordshire, for his Revolving Cheese-drying Frame—Three Sovereigns. To Mr James Inglis, Macbiehill, near Noblehouse, for his Double Paring Plough and Harrow—Three Sovereigns. To Mr Robert Law, Shettlestone, near Glasgow, for his Single Turnip-Sowing Machine—Two Sovereigns. To Mr Peter M'Pherson, Norton Place, Edinburgh, for his Turnip Sowing Machine—Three Sovereigns. To Mr George Ponton, Groughfoot, near Edinburgh, for a Plough calculated to pare the surface and throw it into furrow—One Sovereign. To Messrs T. and W. Smith, agricultural machine makers, St Ninians, Stirling, for a Turnip and Bone-dust Sowing Machine—Three Sovereigns. To Mr Peter Thomson, Peffermill, near Edinburgh, for a Machine for Depositing Soot—Four Sovereigns. To Mr Walls, Carcluie, Rozelle, near Ayr, for a Double Wrist Subsoil Plough for Green Crops—Two Sovereigns. To Mr George Johnston, Newton Stewart, for an improved Winnowing Machine—Four Sovereigns.

The Judges commended the following Implements and Machines, viz.: —The Model of the Patent Machine of Mr John Ainslie, Redheugh, for the making of Drain Tiles. The specimens of Axes and other Tools and Implements by Messrs A. Carrack and Sons, Fisherrow. The specimens of Ploughs by Mr James Hunter, implement maker, Edinburgh. The Patent Cast-steel Spades and Shovels and other Implements by Messrs Redpath, Brown, & Co., Candlemaker Row, Edinburgh. Examples of Iron Field-Gates, Iron Hurdles, and specimens of Wire Work, by Messrs W. and C. Young, 128 High Street, Edinburgh, on account of their cheapness and good workmanship. Fences, and other specimens of Iron Work, by Messrs Joseph Smith and Son, wire-workers, High Street, Edinburgh. Improved Patent Reaping Hooks, by Messrs Robert Sorby and Sons, Sheffield. The valuable collection of Messrs Drummond and Sons, Stirling, comprehending upwards of forty-six articles, amongst which may be noticed the following :—Subsoil and Furrow Plough, suitable to small farmers ; Sidey's Manure and Turnip Drill for dropping the manure and seeds at given intervals. Various machines and mechanical inventions, by Mr Smith, Deanston, amongst which were his Chain Web Harrows, chiefly for the harrowing in of grain, grass, and clover seeds. By Messrs Samuel and Hugh Morton, agricultural implement makers, Leith Walk, consisting of various implements and machines, well adapted to useful practice. By Messrs Slight and Co., agricultural implement makers, Leith Walk, various well constructed machines and implements. By Messrs James Wilkie, Uddingstone, near Glasgow, his Swing Plough, Subsoil Plough, and other implements.

At 3 P.M. the prize stock were walked along the stage erected for the purpose in front of the Ladies' gallery, and at 4, the gates were opened for the departure of the stock, so by that time the meeting may have been said to be over. The band of the Enniskillen Dragoons enlivened the company by their strains of music. The dry and hot weather caused an incessant demand on the soda water and lemonade furnished by the Messrs Aitchison, confectioners. At ½ past 5, a large company, amounting to about 2000 in number, sat down to dinner in a handsome pavilion of wood roofed with zinc, erected by Mr Gibb for the purpose, on the esplanade of the Castle, from the plan and under the superintendence of Mr Slight. The company was presided over by the Duke of Richmond, President of the Society, and the croupier's chair was occupied by the Duke of Roxburghe, one of the Vice-Presidents. The company broke up at an early hour.

On the Wednesday morning by 10 o'clock, all the prize stock were again on the show-ground, occupying their respective stalls, when a favourable opportunity offered of examining them minutely. The committee on portraits fixed on the animals whose likenesses were desired to be taken, to add to the decoration of the picture gallery in the Museum. Mr Gourlay Steell of Edinburgh, and Mr Percy Foster of Alnwick, were the artists selected to execute the paintings. A sale of stock by auction took place on the ground, conducted by those desirous of disposing of their stock. There were a few sold, but the prices realized were not to a large amount. The truth is, people will not part with their *good* stock but at fancy prices. By 3 o'clock in the afternoon, the entire meeting came to an end. How many people actually witnessed the Show, it is impossible to conjecture, as some paid half-a-crown, and others only one shilling. The admission fee on the Monday and Wednesday was one shilling, as also on Tuesday after 1 o'clock of the afternoon; but from the morning to 1 o'clock, it was half a crown, and a great many availed themselves of the privilege of entering at so early an hour. The number of people who got into the show-yard, including those who had charge of the articles exhibited, could not be less than 26,000, as the sum of L.1350 was collected, a larger sum by L.500 than was ever collected on a similar occasion by the Society. The Lothian Road was a scene of great animation on the whole of the show day, every species of vehicle having been put into requisition to carry the eager spectators to the Exhibition, and the Meadows and Bruntsfield Links were no less occupied by streams of pedestrians moving to and from the town.

At three o'clock in the afternoon, a lecture "On the absorption of liquids by growing trees," was delivered in the Society's Museum by Mr Hyett of Painswick House, Gloucestershire, which he illustrated with numerous specimens of wood, cut from the trees that had been subjected by him to experiment. The lecture will be found at length in the leading article of the Transactions of the Society, in this number. Whilst noticing this lecture, we think it not out of place to mention an interesting fact, of which we were made acquainted by Dr Hamel, and record it here as a matter of history. It appears that, so long ago as 1834, Dr Hamel, who is a Member of the Imperial Academy of Sciences at St Petersburgh, communicated to that Academy a plan of making the living and yet standing tree absorb corrosive sublimate by introducing it into holes bored at the lower part of the trunk. This proposition was made by him in consequence of an official demand addressed by His Imperial Highness the Grand Duke Michael to the Academy, regarding the efficacy of the method of preserving timber from dry-rot, as practised by Mr Kyan in England. Being named one of the Commissioners appointed to report on this subject, Dr Hamel expressed his conviction of the absolute necessity there was of having the central part of the logs of timber impregnated with the preserving liquid as completely as the parts near the outside; and as he supposed that, even by very powerful pumps, the extraction of the air could not be effected in so complete a manner as to get, by the subsequent pressure of the atmosphere, the surrounding liquor forced into the very middle of a large log, he hit upon the idea of making use of the vital principle of the tree itself. For that purpose he proposed to bore holes at the root-end of the trunk early in spring, when the sap begins to ascend, hoping that the corrosive sublimate, or other timber preserving substances, being introduced into these holes, would not only be carried by the sap to every portion of the tree, even to the highest extremities, but that the entire body of the wood would thereby be imbued with the preserving substance in an infinitely more intimate manner than could ever be effected by any immersion of dead timber. Dr Hamel has ever since regretted that, in the spring season, which he considered as the most proper for the purpose in view, he never had a convenient opportunity of putting his idea to the test of experiment; and on that account he felt much interest in the details of the experiments which he heard related by Mr Hyett.

Deputations from the Royal Agricultural Society of England and the Royal Improvement Society of Ireland attended the Show. Mr Childers, M.P. for Malton, and his friends, represented the former; and Mr Bullen, secretary, and his friends, the latter society.

THE AGRICULTURISTS' NOTE-BOOK.—NO. XIX.

What is the Insect which destroys the Barley Crop?—By Mr J. Chrisp, Rugley.—It is now several years since a neighbour directed my attention to a great defect in his barley crop, which was apparently caused by the ravages of some insect in the larva state living in the sheath, and feeding upon the ear previous to its appearance from the shot-blade, which, like nearly all the injuries of insects in the embryo state, goes by the designation of "grubbing." Every year I have observed more or less injury to the crop by the same cause, but it appears most serious in a late or wet cold year upon stiff soils. Having hitherto failed in determining the perfect insect, and finding the other day in looking over my barley that there were several affected stems, I picked a few, which I have enclosed in a small box, and now transmit by a friend,* that, by the assistance of some entomologist, we may at least know the name and history of our foe, and be enabled more certainly to take means for its destruction, or otherwise try to prevent its ravages. At the time these specimens were gathered the healthy plants were shot and at full growth, the attack of the insect must therefore prevent all these stalks from yielding any grain ; and that such is the case I can testify by my experience at the harvest. The injury appears to be caused by the larva feeding upon the internal parts of the plant in its earliest state, and the transformations are made within the shot-blade, where the pupa is to be found about this time of the year. Here, however, I am unable to trace the insect farther, as, at the time of reaping, the perfect insect appears to have then escaped from the pupa cases, and I am at a loss to know what becomes of it during the winter, though it may deposite its eggs upon some other plant, and by thus remaining dormant during the autumn and winter, be ready to hatch others for the spring attacks upon the barley crops.

A proposition for superseding the practice of handpicking weeds on Turnip Fallows.—After the field intended for turnips gets the first spring-ploughing, which should be deep, let it be thoroughly harrowed at intervals three or more double times, not omitting the use of the heavy roller when necessary; then use the grubber, going as deep as convenient. Again harrow, and so forth, rolling, grubbing, and harrowing crossways alternately, till the whole weeds are well shaken out. Then again apply the heavy roller, *twice* if the field is much infested with stones, so that the surface may be thereby made smooth and compact. After this, harrow with a light brush-harrow once or twice, which will leave the whole weeds in a loose state on the surface separated from earth and stones, and if these should be so large as to defy the pressure of the roller, they should be previously picked off the field. The last operation of gathering the weeds into *wind-rows* may be performed by the patent horse-hay and grain-stubble rake of America, or perhaps one of a more simple construction may be invented for weeds exclusively. These wind-rows may be burned where they lie. The field will then be ready for being sowed.*

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* The articles alluded to have never reached us.—EDITOR.

Slit-Planting. By Mr A. Gorrie.—This mode of planting, so generally adopted in many parts of Scotland, is held up against us by the Southrons as a term of reproach—a poor Scots shift; reminding us that our necessity or poverty is the mother of invention. While, however, our moors continue to be clothed with thriving plantations and rich pastures, which, but for slit-planting, would still have been covered with "whins and heather," we can afford to point to them as an answer to our more wealthy friends in the south.

In the brief remarks I now intend making, I shall not stop to argue against trenching, ploughing, or otherwise preparing moor-ground for planting, processes which, in some instances, and on certain sorts of soil, may tend to promote the growth of timber-trees, but in other cases the advantage of which might be doubtful. One thing, however, is certain, that preparation by trenching poor soils occasions an outlay which, added to the other expense of planting, draining, and fencing, would, calculated at ordinary interest, amount in 60 or 80 years to far more than the proceeds would bring; but near the domain, or where the improvement of the landscape is an object, trenching may produce more sudden effect, and the extra expense will be put down to the account of "taste." As slit-planting is not likely to be soon written down or abandoned, may I be permitted to describe a method which I have frequently adopted, with much advantage, in planting out two or three years' transplanted larch or Scots fir, on exposed situations.

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* A figure and description of the American hay-rake are given in vol. iii. p. 40, of the Prize Essays and Transactions of the Highland and Agricultural Society.—Editor.

On very bare moors I have always found one year transplanted resinous plants succeed best; but where broom or furze predominate, or where the ground is clothed with long heath or coarse herbage, older trees have a better chance of succeeding well; and, though the furze or broom may be removed, or the heather burnt, yet, when the ground under plantation is necessarily protected from cattle or sheep, the natural plants soon get up, and may be apt to choke the young trees, if the plants introduced are too young at the time of planting. Another consideration, too, in favour of taller plants is, that they sooner get beyond the reach of hares or rabbits, to prevent the depredations of which, on bare moors, where young plants were inserted, a sprinkling of laburnum trees I have found useful.

Whether tall plants are slitted or pitted, they, in the ordinary way of being planted perpendicular, are very liable to *windwaving* before they acquire strength and length of root to resist the effects of strong winds. To avoid windwaving —than which nothing can be more detrimental to newly-planted trees—I have long practised laying all resinous plants, particularly larches, at an angle of about twenty degrees with the horizon. With their tops pointing in this slanting position to the south-west, the point from which our highest winds most frequently blow, their under-branches touch the ground, and the plant reclines undisturbed by any wind that blows from whatever quarter—aye, and until its roots are able to afford protection. If the plantation is thriving, the plants will gradually assume an upright position, and, by the middle of the second summer after planting, the whole will stand quite perpendicular, without any danger from future winds. To every practical planter it will be obvious, that a little more care is necessary, to observe that, in bending the plant, no part of the root is left too near the surface, than in the ordinary method; but the attention often bestowed on having tall plants left to stand perpendicular, to be blown about by the first wind, and so leaving numbers to be what is called "beeted up" by the end of the second year, is much greater, and requires more time, than in laying the plant in a safe and slanting position.

New Corn-Duties.—The new corn law is intituled "An Act to amend the laws for the importation of Corn." It was passed in the 5th Vict. sess. 2, cap. 14. The following is the table of duties which now govern the importation of corn, whether from foreign countries or the colonies:—

I. If imported from any FOREIGN COUNTRY.

1. *Wheat*—

Whenever the average price of wheat, made up and published in the manner required by law, shall be for every quarter.

...	under 51s., the duty shall be for every quarter,	L.1	0	0
...	51s. and under 52s.,	0	19	0
...	52s. ... 55s.,	0	18	0
...	55s. ... 56s.,	0	17	0
...	56s. ... 57s.,	0	16	0
...	57s. ... 58s.,	0	15	0
...	58s. ... 59s.,	0	14	0
...	59s. ... 60s.,	0	13	0
...	60s. ... 61s.,	0	12	0
...	61s. ... 62s.,	0	11	0
...	62s. ... 63s.,	0	10	0
...	63s. ... 64s.,	0	9	0
...	64s. ... 65s.,	0	8	0
...	65s. ... 66s.,	0	7	0
...	66s. ... 69s.,	0	6	0
...	69s. ... 70s.,	0	5	0
...	70s. ... 71s.,	0	4	0
...	71s. ... 72s.,	0	3	0
...	72s. ... 73s.,	0	2	0
...	73s. and upwards,	0	1	0

2. *Barley*—

Whenever the average price of barley, made up and published in the manner required by law, shall be for every quarter.

...	under 26s., the duty shall be for every quarter,	L.0	11	0
...	26s. and under 27s.,	0	10	0
...	27s. ... 30s.,	0	9	0
..	30s. ... 31s.,	0	8	0
...	31s. ... 32s.,	0	7	0
...	32s. ... 33s.,	0	6	0
...	33s. ... 34s.,	0	5	0
...	34s. ... 35s.,	0	4	0
...	35s. ... 36s.,	0	3	0
...	36s. ... 37s.,	0	2	0
...	37s. and upwards,	0	1	0

3. *Oats*—

Whenever the average price of oats, made up and published in the manner required by law, shall be for every quarter

... under 19s., the duty shall be for every quarter,	L.0	8	0
... 19s. and under 20s.,	0	7	0
... 20s. ... 23s.,	0	6	0
... 23s. ... 24s.,	0	5	0
... 24s. ... 25s.,	0	4	0
... 25s. ... 26s.,	0	3	0
... 26s. ... 27s.,	0	2	0
... 27s. and upwards,	0	1	0

4. *Rye, Pease, and Beans*—

Whenever the average price of rye, or of pease, or of beans, made up and published in the manner required by law, shall be for every quarter

... under 30s., the duty shall be for every quarter,	L.0	11	6
... 30s. and under 33s.,	0	10	6
... 33s. ... 34s.,	0	9	6
... 34s. ... 35s.,	0	8	6
... 35s. ... 36s.,	0	7	6
... 36s. ... 37s.,	0	6	6
... 37s. ... 38s.,	0	5	6
... 38s. ... 39s.,	0	4	6
... 39s. ... 40s.,	0	3	6
... 40s. ... 41s.,	0	2	6
... 41s. ... 42s.,	0	1	6
... 42s. and upwards,	0	1	0

5. *Wheat-Meal and Flour*—

For every barrel, being one hundred and ninety-six pounds.

A duty equal in amount to the duty payable on thirty-eight and a half gallons of wheat.

6. *Oatmeal*—

For every quantity of one hundred and eighty-one pounds and a half,

A duty equal in amount to the duty payable on a quarter of oats.

7. *Maize or Indian Corn, Buck-Wheat, Bear or Bigg*—

For every quarter,

A duty equal in amount to the duty payable on a quarter of barley.

II. If the Produce of, and imported from, any British Possession in North America, or elsewhere out of Europe.

1. *Wheat*—

Whenever the average price of wheat, made up and published in the manner required by law, shall be

... under 55s. for every quarter, the duty shall be for every quarter,	L.0	5	0

1. *Wheat—cont.*

...	55s. and under 56s.,	L.0	4	0
...	56s. ... 57s.,	0	3	0
...	57s. .. 58s.,	0	2	0
...	58s. and upwards,	0	1	0

2. *Barley*—

Whenever the average price of barley, made up and published in the manner required by law, shall be

...	under 28s. for every quarter, the duty shall be for every quarter,	L.0	2	6
...	28s. and under 29s.,	0	2	0
...	29s. ... 30s.,	0	1	6
...	30s. ... 31s.,	0	1	0
...	31s. and upwards,	0	0	6

3. *Oats*—

Whenever the average price of oats, made up and published in the manner required by law, shall be

...	under 22s. for every quarter, the duty shall be for every quarter,	L.0	2	0
...	22s. and under 23s.,	0	1	6
...	23s. and upwards,	0	0	6

4. *Rye, Pease, and Beans*—

Whenever the average price of rye, or of pease, or of beans, made up and published in the manner required by law, shall be

...	under 30s. for every quarter, the duty shall be for every quarter,	L.0	3	0
...	30s. and under 31s.,	0	2	6
...	31s. ... 32s.,	0	2	0
...	32s. ... 33s.,	0	1	6
...	33s. ... 34s.,	0	1	0
...	34s. and upwards,	0	0	6

5. *Wheat, Meal, and Flour*—

For every barrel, being one hundred and ninty-six pounds,

A duty equal in amount to the duty payable on thirty-eight and a half gallons of wheat.

6. *Oatmeal*—

For every quantity of one hundred and eighty-one pounds and a half,

A duty equal in amount to the duty payable on a quarter of oats.

7. *Maize or Indian Corn, Buck-Wheat, Bear or Bigg*—

For every quarter,

A duty equal in amount to the duty payable on a quarter of barley.

The following is a list of the cities and towns which make the returns that affect the average prices. Those marked with an * are the towns which began to make returns under the new act:—

Cheshire.
Chester
Nantwich
Middlewich
Four Lane Ends
* Congleton
* Macclesfield
* Stockport

Lancaster.
Liverpool
Ulverston
Lancaster
Preston
Wigan
Warrington
Manchester
Bolton
* Blackburn
* Bury
* Rochdale

Derby.
Derby
* Chesterfield

Nottingham.
Nottingham
Newark
* Mansfield
* Retford

Leicester.
Leicester
* Loughborough
* Hinckley
* Lutterworth

Northampton.
Northampton
* Peterborough
* Daventry
* Wellingborough
* Kettering

Warwickshire.
Coventry
Birmingham
* Warwick
* Stratford-on-Avon

Cornwall.
Truro
Bodmin
Launceston
Redruth
Helston
St Austell
* Falmouth
* Callington
* Liskeard
* St Columb

Dorsetshire.
Blandford
Bridport
Dorchester
Sherborne
Shaftesbury
Wareham
* Poole

Hampshire.
Winchester
Andover
Basingstoke
Fareham
Havant
Newport
Ringwood
Southampton
Portsmouth
* Christchurch

Rutland.
* Okeham

Hereford.
* Leominster

Hereford—cont.
* Hereford
* Kington

Shropshire.
* Shrewsbury
* Ludlow
* Newport
* Oswestry
* Wellington
* Wenlock
* Whitechurch
* Market Drayton

Wiltshire.
* Swindon
* Devizes
* Salisbury
* Troubridge
Warminster
* Chippenham

Bedford.
Bedford
* Leighton Buzzard
* Luton

Berkshire.
Windsor
Reading
* Abingdon
* Maidenhead
* Newbury
* Wallingford

Bucks.
Aylesbury
* Buckingham
* High Wycombe
Newport Pagnel

Oxfordshire.
Oxford
* Banbury

Oxfordshire—cont.
* Henley
* Witney
* Chipping Norton

Huntingdon.
Huntingdon
St Ives

Cambridge.
Cambridge
Ely
Wisbeach
* Newmarket

Suffolk.
Ipswich
Woodbridge
Sudbury
Hadleigh
Stowmarket
Beccles
Bungay
Lowestoft
Bury St Edmund's

Norfolk.
Norwich
Yarmouth
Lynn
Thetford
Watton
Diss
East Dereham
Harleston
Holt
Aylsham
Fakenham
North Walsham
* Swaffham

Northumberland.
Walsingham
Belford
Hexham
Newcastle-upon-Tyne
Morpeth
Alnwick
Berwick

Cumberland.
Carlisle
Whitehaven
Cockermouth
Penrith
Egremont
* Wigton
* Maryport
* Workington

Westmoreland.
Appleby
Kendal

Worcester.
Worcester
* Broomsgrove
* Kidderminster
* Stourbridge
* Evesham

Gloucester.
Gloucester
Cirencester
Tetbury
Stow-on-the-Wold
Tewkesbury
* Cheltenham
* Dursley
* North Leach
* Stroud

Somersetshire.
Bristol
Taunton
Wells
Bridgewater
Frome
Chard
* Somerton
* Shepton Mallet
* Wellington
* Wiveliscomb

Monmouthshire.
Monmouth
Abergavenny
Chepstow
Pontypool

Monmouthshire—cont.
* Newport

Devonshire.
Exeter
Barnstaple
Plymouth
Totness
Tavistock

Kingsbridge
* Oakhampton
* Tiverton
* Honiton

Staffordshire.
* Stafford
* Burton-on-Trent
* Lichfield
* Newcastle-under-Lyme
* Stone
* Uttoxeter
* Walsall
* Wolverhampton

Middlesex.
London
Uxbridge

Hertfordshire.
Hertford
Royston
* Bishop Stortford
* St Albans
* Hemel Hempstead
* Hitchin

Surrey.
Guildford
* Croydon
* Kingston
* Dorking

Essex.
Chelmsford
Colchester
Romford
* Chipping Ongar

Essex—cont.
* Saffron Walden
* Braintree

Kent.
Maidstone
Canterbury
Darford
* Chatham & Rochester
* Dover
* Gravesend
* Ashford

Sussex.
Chichester
Lewes
Rye
* Brighton
* East Grinstead
* Battle
* Arundel
* Hastings
* Midhurst
* Shoreham

Lincoln.
Lincoln
Gainsborough
Glanford Bridge
Louth
Boston
Sleaford
Stamford

Lincoln—cont.
Spalding
* Burton-on-Humber
* Bourne
* Grantham
* Grimsby
* Horncastle
* Market Raisin
* Caistor
* Alford
* Holbech
* Long Sutton

York.
York
Leeds
Wakefield
Bridlington
Beverley
Hawden
Sheffield
Hull
Whitby
New Malton
* Barnsley
* Bedale
* Bradford
* Doncaster
* Knaresborough
* Pickering
* Richmond
* Ripon
* Selby

York—cont.
* Skipton
* Thirsk
* Rotherham
* Otley
* Thorne

Durham.
Durham
Stockton
Darlington
Sunderland
Barnard Castle

Wales.
Carmarthen
Carnarvon
Haverfordwest
Cardiff
Denbigh
Wrexham
* Brecon
* Mold
* Bangor
* Cowbridge
* Newtown
* Corwen
* Welshpool
* Llangefni
* Llandillo
* Knighton
* Swansea

New Tariff.—The following are the duties determined by the new tariff on all articles imported of agricultural and horticultural produce, and timber. The act is intituled "An Act to amend the laws relating to the Customs." It was passed in the 5th and 6th Vict., cap. 47, 9th July 1842. We may observe, that the list of articles enumerated in the act are divided into classes, of which there are nineteen in number, but which classification, in the articles specified here, we think it unnecessary to retain.

ARTICLES.		Rates of Duty.					
		Of or from Foreign Countries.			Of and from British Possessions.		
		L.	S.	D.	L.	S.	D.
Animal (living), viz.—							
Asses	each	0	2	6	0	1	3
Goats	„	0	1	0	0	0	6
Kids	„	0	1	0	0	0	6
Oxen and Bulls	„	1	0	0	0	10	0
Cows	„	0	15	0	0	7	6
Calves	„	0	10	0	0	5	0
Horses, Mares, Geldings, Colts, Foals	„	1	0	0	0	10	0
Mules	„	0	2	6	0	1	3
Sheep,	„	0	3	0	0	1	6
Lambs,	„	0	2	0	0	1	0
Swine and Hogs	„	0	5	0	0	2	6
Pigs (sucking)	„	0	2	0	0	1	0
Poultry	for every L.100 value	5	0	0	2	10	0
Arrow-root	the cwt.	0	5	0	0	1	0
Capers, including the Pickle	the lb.	0	0	6	0	0	3
Cassava Powder	the cwt.	0	5	0	0	1	0
Chicory, or any other Vegetable Matter applicable to the uses of Chicory or Coffee:—							
„ Roasted or dried	the lb.	0	0	6	0	0	6
„ Raw or kiln-ground	the cwt.	1	0	0	1	0	0
Cucumbers, preserved	for every L.100 value	10	0	0	5	0	0
Fruit, Raw, and not otherwise enumerated,	for every L.100 value	5	0	0	5	0	0
„ Almonds, not Jordan nor Bitter,	the cwt.	0	10	0	0	10	0
„ „ Jordan	„	1	5	0	1	5	0
„ „ Bitter	„	0	2	0	0	2	0
„ „ Paste of	for every L.100 value	20	0	0	20	0	0
„ Apples, raw	the bush.	0	0	6	0	0	2
„ „ dried,	„	0	2	0	0	2	0
„ Berries, unenumerated	the cwt.	0	2	0	0	2	0
„ Cherries, raw	for every L.100 value	5	0	0	5	0	0
„ „ dried	the lb.	0	0	6	0	0	6
„ Citron preserved with salt	for every L.100 value	10	0	0	10	0	0
„ Cranberries	the gall.	0	0	1	0	0	1
„ Currants	the cwt.	1	2	2	1	2	2
„ Dates	„	0	10	0	0	10	0
„ Figs	„	0	15	0	0	15	0
„ Grapes	for every L.100 value	5	0	0	5	0	0
„ Medlars	the bush.	0	1	0	0	0	6
„ Nuts, viz.—Chestnuts	the bush.	0	2	0	0	2	0
„ „ Cocoa-nuts	the 1200		—		0	1	0
„ „ Pistachio Nuts	the cwt.	0	10	0	0	10	0
„ „ Small Nuts	the bush.	0	2	0	0	2	0
„ „ Walnuts	„	0	2	0	0	2	0
„ „ Nuts, not otherwise enumerated, except such as are commonly used for expressing Oil, therefrom	for every L.100 value	20	0	0	20	0	0
„ Olives	the gall.	0	2	0	0	2	0
„ Oranges and Lemons, viz.—							
In chests and boxes not exceeding 5000 cubic inches	the box	0	2	6	0	2	6
Over 5000 cubic inches, and not exceeding 7300	the box	0	3	9	0	3	9
Over 7300 cubic inches, and not exceeding 14,000	the box	0	7	6	0	7	6

ARTICLES.		Rates of Duty.					
		Of or from Foreign Countries.			Of and from British Possessions.		
		L.	s.	d.	L.	s.	d.
For every 1000 cubic inches exceeding 14,000		0	0	7½	0	0	7½
Loose	the 1000	0	15	0	0	15	0
Entered at value, at the option of the importer	for every L.100 value	75	0	0	75	0	0
„ Pears, raw	the bush.	0	0	6	0	0	3
„ „ dried	„	0	2	0	0	2	0
„ Peel of Lemons	the cwt.	0	1	0	0	1	0
„ „ of Oranges	„	0	1	0	0	1	0
„ „ of Pomegranates	„	0	1	0	0	1	0
„ Plums (commonly called French Plums) and Prunelloes	the cwt.	1	0	0	1	0	0
„ „ dried or preserved	„	1	7	6	1	7	6
„ Pomegranates	the 1000	0	5	0	0	5	0
„ Prunes	the cwt.	0	7	0	0	7	0
„ Quinces	the 1000	0	1	0	0	1	0
„ Raisins	the cwt.	0	15	0	0	7	6
„ Tamarinds	the lb.	0	0	3	0	0	1
Grain, not rated as Corn or Seeds, viz.—							
Barley, pearled	the cwt.	0	5	0	0	2	6
Beans, Kidney and French	the bush.	0	0	10	0	0	5
Rice, not rough nor in the husks	the cwt.	0	6	0	0	0	6
„ rough and in the husks	the quarter	0	7	0	0	0	1
Hay	the load	0	16	0	0	8	0
Honey	the cwt.	0	10	0	0	5	0
Hops	„	4	10	0	4	10	0
Liquorice Roots	„	1	0	0	0	10	0
Oil Seed Cakes	the ton	0	1	0	0	1	0
Pickles of all sorts, including the vinegar, and not otherwise enumerated	the gall.	0	1	6	0	0	9
„ preserved in salt	„	0	0	6	0	0	3
Provisions, viz.—Bacon	the cwt.	0	14	0	0	3	6
Beef, salted, not being corned Beef, from and after 10th October 1842	the cwt.	0	8	0	0	2	0
„ „ fresh, or slightly salted	„	0	8	0	0	2	0
Butter	„	1	0	0	0	5	0
Cheese	„	0	10	6	0	2	6
Eggs	the 120	0	0	10	0	0	2½
Hams of all kinds	the cwt.	0	14	0	0	3	6
Lard	„	0	2	0	0	0	6
Pork, salted (not Hams), from and after 10th October 1842	the cwt.	0	8	0	0	2	0
„ fresh	„	0	8	0	0	2	0
Puddings and Sausages	the lb.	0	0	3	0	0	1
Tongues	the cwt.	0	10	0	0	2	6
Salted or Fresh Meat, not otherwise described	the cwt.	0	8	0	0	2	0
Tapioca	„	0	1	0	0	1	0
Truffles	the lb.	0	1	0	0	1	0
Vanelloes	„	0	5	0	0	5	0
Vegetables, viz.—Lentiles	the bush.	0	0	3	0	0	1½
Onions	„	0	0	6	0	0	3
Plantains	the cwt.	0	0	2	0	0	2
Potatoes	„	0	0	2	0	0	1
All Vegetable not enumerated or described	for every L.100 value	5	0	0	2	10	0

ARTICLES.		Rates of Duty.	
		Of or from Foreign Countries.	Of and from British Possessions.
		L. S. D.	L. S. D.
Seeds, viz.—Acorns	the bush.	0 1 0	0 0 6
Aniseed	the cwt.	0 5 0	0 2 6
Canary	the bush.	0 4 0	0 2 0
Carraway	the cwt.	0 10 0	0 5 0
Carrot	„	0 10 0	0 5 0
Clover	„	0 10 0	0 5 0
Cole	the qr.	0 0 1	0 0 1
Coriander	the cwt.	0 5 0	0 2 6
Cummin	„	0 5 0	0 2 6
Fennugreek	„	0 5 0	0 2 6
Flax	the qr.	0 0 1	0 0 1
Forest	the cwt.	0 10 0	0 5 0
Garden, not particularly enumerated or described, nor otherwise charged with duty	the lb.	0 0 1	0 0 1
Grass of all sorts, not particularly enumerated or otherwise charged with duty	the cwt.	0 5 0	0 2 6
Hemp	the qr.	0 0 1	0 0 1
Leek	the cwt.	1 0 0	0 10 0
Lettuce	the qr.	0 1 0	0 1 0
Linseed	„	0 0 1	0 0 1
Lucerne	the cwt.	0 5 0	0 5 0
Lupines	„	0 5 0	0 5 0
Maw	the qr.	0 1 0	0 0 6
Millet	the cwt.	0 5 0	0 2 6
Mustard	the bush.	0 1 3	0 0 6
Onion, from and after 5th July 1843	the cwt.	1 0 0	0 10 0
Parsley	„	0 10 0	0 5 0
Poppy	the qr.	0 1 0	0 0 6
Quince	the cwt.	0 10 0	0 5 0
Rape	the qr.	0 0 1	0 0 1
Sesamum	„	0 0 1	0 0 1
Shrub or Tree	the cwt.	0 10 0	0 5 0
Tares	the qr.	0 5 0	0 2 6
Trefoil	the cwt.	0 5 0	0 2 6
Worm	„	0 5 0	0 2 6
All seeds not particularly enumerated or described, nor otherwise charged with duty, commonly used for expressing oil therefrom	the qr.	0 0 1	0 0 1
All other seeds not particularly enumerated or described, nor otherwise charged with duty	for every L.100 value	10 0 0	5 0 0
		From and after the 10th October 1842.	
Timber or Wood—not being Deals, Battens, Boards, Staves, Handspikes, Oars, Lathwood, or other Timber or Wood, sawn, split, or otherwise dressed, except hewn, and not being Timber or Wood otherwise charged with duty	the load of 50 cubic feet	1 10 0 From & aft. 10th Oct. 1843, 1 5 0	0 1 0
Deals, Battens, Boards, or other Timber or Wood, sawn, or split, and not otherwise charged with duty	the load of 50 cubic feet	1 18 0 From & aft. 10th Oct. 1843, 1 12 0	0 2 0

Or, in lieu of the Duties hereinbefore imposed upon Wood by the Load, according to the cubic content, the Importer may have the option, at the time of passing the first entry, of entering Battens, Batten-Ends, Boards, Deals, Deal-Ends, and Plank, by Tale, if of or from Foreign Countries, according to the following dimensions, viz.:—

		From and after the 10th October 1842.		From and after the 10th October 1843.	
Battens and Batten-Ends—	Not above 7 in. in width.	Not above 1¼ in. in thickness.	Above 1¼ in. & not above 2¾ in thickness.	Not above 1¼ in. in thickness.	Above 1¼ in. & not above 2¾ in thickness.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
Not above 6 feet in length . . . the 120	”	1 16 7	3 13 2	1 10 10	3 1 7
Above 6 and not above 9 feet in length . . . ”	”	2 14 10	5 9 9	2 6 2	4 12 5
Above 9 and not above 12 feet in length . . ”	”	3 13 2	7 6 4	3 1 7	6 3 2
Above 12 and not above 15 feet in length . . ”	”	4 11 5	9 2 10	3 17 0	7 14 0
Above 15 and not above 18 feet in length . . ”	”	5 9 9	10 19 6	4 12 5	9 4 10
Above 18 and not above 21 feet in length . . ”	”	6 8 0	12 16 0	5 7 9	10 15 7
Boards, Deals, Deal-Ends, and Plank—	Not above 9½ in. in width.	Not above 1½ in. in thickness.	Above 1½ in. & not above 3¼ in thickness.	Not above 1½ in. in thickness.	Above 1½ in. & not above 3¼ in thickness.
Not above 6 feet in length . . . the 120	”	2 18 8	5 17 4	2 9 5	4 18 10
Above 6 and not above 9 feet in length . . ”	”	4 8 0	8 16 0	3 14 1	7 8 3
Above 9 and not above 12 feet in length . . ”	”	5 17 4	11 14 8	4 18 10	9 17 8
Above 12 and not above 15 feet in length . . ”	”	7 6 8	14 13 4	6 3 6	12 7 1
Above 15 and not above 18 feet in length . . ”	”	8 16 0	17 12 0	7 8 3	14 16 6
Above 18 and not above 21 feet in length . . ”	”	10 5 4	20 10 8	8 12 11	17 5 11
Not above 6 feet in length . . . . . ”	Above 9½ in. & not above 11½ in width.	3 11 0	7 2 0	2 19 10	5 19 7
Above 6 and not above 9 feet in length . . ”	”	5 6 6	10 13 0	4 9 8	8 19 5
Above 9 and not above 12 feet in length . . ”	”	7 2 0	14 4 0	5 19 7	11 19 2
Above 12 and not above 15 feet in length . . ”	”	8 17 6	17 15 0	7 9 6	14 19 0
Above 15 and not above 18 feet in length . . ”	”	10 13 0	21 6 0	8 19 5	17 18 9
Above 18 and not above 21 feet in length . . ”	”	12 8 6	24 17 0	10 9 4	20 18 7

ARTICLES.	Rates of Duty.	
	Of or from Foreign Countries.	Of and from British Possessions.
	L. S. D.	L. S. D.
Staves . . . . the load of 50 cubic ft.	1 8 0	0 2 0
Birch, hewn, not exceeding 3 ft. in length, nor exceeding 8 in. square, imported for the sole purpose of making Herring barrels for the use of the Fisheries the load of 50 ft.	0 1 0	0 1 0
Firewood . . the fathom of 216 cubic ft.	0 10 0	Free
Handspikes, not exceeding 7 ft. in length the 120	1 0 0	0 0 6
" exceeding 7 ft. in length . "	2 0 0	0 1 0
Hoops, not exceeding 7½ ft. in length . the 1000	0 2 0	0 0 4
" not exceeding 9 ft. in length . "	0 3 0	0 0 6
" exceeding 9 ft. in length . . "	0 5 0	0 1 0
Knees, under 5 in. square . . . the 120	0 10 0	0 0 3
" 5 in. and under 8 in. square . . "	2 0 0	0 1 0
Lathwood . . the fathom of 216 cubic ft.	2 0 0	0 1 0
Oars . . . . the 120	7 10 0	0 3 9
Spars or Poles, under 22 ft. in length and under 4 in. in diameter . . . . . . the 120	1 0 0	0 0 6
" 22 ft. in length and upwards, and under 4 in. in diameter . . . . the 120	2 0 0	0 1 0
" of all lengths, 4 in. and under 6 in. in diameter . . . . . the 120	4 0 0	0 2 0
Spokes for Wheels, not exceeding 2 ft. in length, the 1000	2 0 0	0 1 0
" " exceeding 2 ft. in length "	4 0 0	0 2 0
Teak . . . . . the load of 50 cubic ft.	0 10 0	0 1 0
Wastewood, viz.—Billetwood or Brushwood, used for the purposes of stowage . for every L.100 value	5 0 0	0 3 0
Wood planed, or otherwise dressed or prepared for use, and not particularly enumerated, nor otherwise charged with duty	9d. per ft. of cubic contents, and further for every L.100 value, 10 0 0 From and after the 10th Oct. 1842, 7½d. per ft. of cubic contents, and further for every L.100 value, 10 0 0	For every L.100 value, 5 0 0
Nuts, or Kernels thereof, not otherwise enumerated, used for expressing Oil . . the ton	0 1 0	0 0 6
Alkali, not being Barilla . . . the cwt.	0 1 6	0 1 6
Alum . . . . . . "	0 2 0	0 0 0
Ashes, viz.—		
Pearl and Pot . . . . "	0 0 6	Free.
Soap, Weed, and Wood . . . "	0 0 6	Free.
not enumerated . for every L.100 value	5 0 0	Free.
Barilla . . . . . . the ton	0 5 0	0 5 0
Bark, for tanner's use . . . the cwt.	0 0 3	0 0 1
Berries, Bay . . . . . "	0 1 0	0 1 0
Juniper . . . . . "	0 1 0	0 1 0
Yellow . . . . . "	0 1 0	0 1 0
not enumerated, commonly made use of in chemical processes . . . . the ton	0 1 0	0 1 0

ARTICLES.		Rates of Duty.					
		Of or from Foreign Countries.			Of and from British Possessions.		
		L.	S.	D.	L.	S.	D.
Camomile Flowers	the lb.	0	0	1	0	0	1
Glue	the cwt.	0	3	0	0	3	0
Clippings, or Waste of any kind, fit only for Glue	for every L.100 value	1	0	0	1	0	0
Lavender Flowers	the lb.	0	0	1	0	0	1
Leaves of Roses	„	0	0	2	0	0	2
Madder	the cwt.	0	0	6	0	0	6
„ Root	„	0	0	3	0	0	3
Nitrate of soda and saltpetre	„	0	0	6	0	0	6
Orchal	„	0	1	0	0	1	0
Sal Ammoniac	„	0	1	0	0	1	0
Wax, Bees'	„	0	2	0	0	1	0
„ in any degree bleached	„	1	0	0	0	10	0
„ Myrtle	„	0	2	0	0	1	0
Woad,	the ton	0	5	0	0	5	0
Skins and Furs, viz.—							
Cat, undressed	the dozen skins	0	1	0	0	0	6
Coney, undresssed	the 100 skins	0	0	6	0	0	3
Dog, in the hair, not tanned, tawed, or in any way dressed,	the skin	0	0	2	0	0	1
Goat, raw or undressed	the dozen skins	0	0	3	0	0	2
„ tanned, tawed, or in any way dressed	the dozen skins	0	5	0	0	2	6
Goose, undressed	„	0	1	0	0	0	6
Hare, undressed	the 100 skins	0	0	6	0	0	3
Kid, in the hair, undressed	„	0	0	4	0	0	2
„ dressed	„	0	5	0	0	2	6
„ do., and dyed or coloured	„	0	10	0	0	5	0
Lamb, undressed in the wool	„	0	0	4	0	0	2
„ tanned or tawed	„	0	5	0	0	2	6
„ do., dyed or coloured	„	0	10	0	0	5	0
„ dressed in oil	„	2	0	0	1	0	0
Mole, undressed	„	0	3	0	0	1	6
Otter	the skin	0	1	0	0	0	6
Sheep, undressed, in the wool	the dozen skins	0	0	6	0	0	3
„ tanned or tawed	the 100 skins	0	12	0	0	6	0
„ dressed in oil	„	1	0	0	0	10	0
Hides, raw and tanned, viz.—							
Of Horse, Mare, Gelding, Buffalo, Bull, Cow, Ox, Calf, Kip, Swine, Hog; not tanned, tawed or curried, or in any way dressed, viz.:—							
Dry	the cwt.	0	0	6	0	0	2
Wet	„	0	0	3	0	0	1
Whether whole, cut, rounded or trimmed, or pieces thereof, not cut into shapes, tanned, but not otherwise dressed	the lb.	0	0	2	0	0	1
Tawed, curried, or in any way dressed, not being varnished, japanned, or enamelled	the lb.	0	0	4	0	0	2
If varnished, japanned, or enamelled	„	0	0	6	0	0	3
Parchment	the dozen sheets	0	6	0	0	6	0
Vellum	the skin	0	1	0	0	1	0
Flax and Tow, or Codilla of Hemp or Flax, whether dressed or undressed	the cwt.	0	0	1	0	0	1
Hair, Cow, Ox, Bull	„	0	0	6	0	0	3
„ Horse	„	0	0	6	0	0	3
Wool, viz.—							
Alpaca and the Llama tribe	the cwt.	0	2	6	0	2	6
Sheep or Lambs' Wool, not being of the value of 1s. the lb. thereof,	the lb.	0	0	0½	Free.		
„ being of the value of 1s. the lb. or upwards	the lb.	0	0	1	Free.		

ARTICLES.	Rates of Duty.					
	Of or from Foreign Countries.			Of and from British Possessions.		
	L.	S.	D.	L.	S.	D.
Bricks or Clinkers (Dutch) . . . the 1000	0	10	0	0	5	0
„ other sorts . . . . . „	0	15	0	0	7	6
Chalk, manufactured, and not otherwise enumerated for every L.100 value	5	0	0	2	10	0
„ prepared or manufactured, and not otherwise enumerated . for every L.100 value	10	0	0	5	0	0
Gypsum . . . . . . the ton	1	11	8	0	1	3
Stone, viz.—						
in lumps, not in any manner hewn; slate and marble in rough blocks or slabs; limestone; flintstones; felspar and stones for potters' use; pebblestones; stones to be used for the purpose of lithography	Free.			Free.		
in blocks, shaped or rough scalped . the ton	0	2	0	0	0	6
stone and slate hewn . . . "	0	10	0	0	1	0
marble, sawn in slabs or otherwise manufactured the cwt.	0	3	0	0	1	6
Tiles . . . . for every L.100 value	10	0	0	5	0	0
Basket rods, peeled, not exceeding 3 feet in circumference at the band . . . the bundle	0	0	6	0	0	6
unpeeled . . . . „	0	0	3	0	0	3
Baskets . . . for every L.100 value	10	0	0	10	0	0
Bladders . . . . . the dozen	0	0	3	0	0	3
Books, viz.—						
being of Editions printed prior to the year 1801, bound or unbound, . . the cwt.	1	0	0	1	0	0
being of Editions printed in or since the year 1801, bound or unbound . . the cwt.	5	0	0	5	0	0
being of Editions in the Foreign Living Languages, printed in or since the year 1801, bound or unbound . . . . the cwt.	2	10	0	2	10	0
Bones of Cattle and other Animals, and of Fish (except Whale Fins), whether burned or not, or as Animal Charcoal . . . . the ton	0	0	6	0	0	6
Bristles, rough, and in the Tufts, and not in any way sorted . . . . . . the cwt.	0	2	6	0	2	6
in any way sorted, or arranged in colours, and not entirely rough and in the tufts . the lb.	0	0	3	0	0	3
Feathers for Beds, in Beds or otherwise . the cwt.	1	0	0	0	10	0
Down . . . . the lb.	0	1	3	0	0	7½
Flower Roots . . for every L.100 value	5	0	0	5	0	0
Greaves for Dogs . . . . the cwt.	0	2	0	0	2	0
Guano . . . . . the ton	0	1	0	0	1	0
Hoofs of Cattle . . for every L.100 value	1	0	0	1	0	0
Horns, Horn Tips, and Pieces of Horn . the ton	0	1	0	0	1	0
Manures not otherwise enumerated or charged with duty the ton	0	0	6	0	0	6
Mustard Flour . . . . the cwt.	0	12	0	0	12	0
Plants, Shrubs, and Trees, alive . . .	Free.			Free.		
Old Woollen Rags . . . . the ton	0	0	6	0	0	6
Salt	Free.			Free.		
Quills, Goose . . . . the 1000	0	0	6	0	0	3
„ Swan . . . . „	0	3	0	0	1	6
Starch . . . . . the cwt.	0	10	0	0	5	0
Straw or Grass for plaiting . . „	0	0	1	0	0	1
Tallow . . . . . „	0	3	2	0	0	3
Teasles . . . . . the 1000	0	0	3	0	0	3

MISCELLANEOUS NOTICES.

I. *On Cheese.*—By James Stuart Menteath, Esq., younger of Closeburn Hall, Dumfriesshire.—By all it seems to be admitted that the raw material of the dairy produce of Scotland, is in no respect inferior to the milk drawn from the udders of kine grazed on the richer pastures of England. Why, then, should our cheese be found so inferior in flavour, that it is generally incapable of competing with the staple ware of Cheshire, Glo'ster, and some other counties? This, to those more immediately concerned, becomes rather an important question; for years there has been a growing tendency to, and gradual extension of, dairy husbandry in Scotland: and as hints, in these circumstances, obtained alike from careful inquiry and personal observation, may prove acceptable to numbers engaged in a most useful branch of rural industry, they are here respectfully submitted as a stimulus and encouragement to future improvement.

In the indictment against Scotch cheese, three principal counts are laid by our neighbours the English. First, that it is of too soapy a nature when opened, the curd being spread in layers, and not sufficiently worked together to form one solid compact mass—a feature at all times distinctly recognisable in a newly-cut Cheshire cheese. Secondly, that it lacks the necessary degree of firmness, not having been well and frequently rubbed with salt when in the vat, and again when taken out of it. Thirdly, that it crumbles down when the knife is applied like a piece of broken short-bread or over-baked oaten cake. Now, as these objections are each and all removable by increased vigilance on the part of dairy-maids, mistresses, and masters, their intelligence is directed to the following points, in the hope, that, if they are attended to, Scotch cheese will rise into favour, and realize higher prices than at present in the markets of the south.

Preparation of the Steep.—A bad practice prevails extensively in the dairy districts of Scotland, which cannot be too soon abandoned—that is, keeping the *steep* months, and even years, in bottles. This practice, in all cases, assumes the form of economy misplaced; for, when preserved over-long, the liquid that curds becomes putrid, and imparts a disagreeable taste to the cheese. In Cheshire, a morsel of the dried salted calf's stomach, or reed, is steeped in water for 24 hours, at the end of which time it is fit for use. A just medium in the use of the steep is of as much importance as nicety in the case of medicine given to the sick; for wherever the mark is overshot, the curd becomes so tough that the greatest difficulty is experienced in expressing the whey. Just what will curdle, and no more, constitutes, in every well-managed dairy, the proper quantity; and not a single particle extra should ever be applied.

Management of Milk previous to Curding.—The temperature of milk newly drawn is from 70° to 80°. In small dairies it generally becomes necessary to add the evening's milk of the previous day to that obtained the following morning, in the preparation of an ordinary sized kebbuck. To produce, therefore, equality of temperature as near as may be, the cold milk must be warmed. In Scotland this is done by placing it in an iron boiler hung over a strong fire; and unless great care be taken, the liquid becomes singed, or *fire-fanged,* to use the technical expression. Wherever this occurs, a kindred taste is communicated to the cheese, a quality which renders its use justly objectionable in the estimation of all competent judges. In Cheshire, in place of an iron vessel, the previous evening's milk is poured into a *tin pail,* covered and placed in boiling water in the iron boiler; stirred frequently, and brought to the proper degree of temperature, on the same principle that a carpenter melts his glue. In this way, by avoiding over-heating, the cream of the cold milk is retained in its natural state, and not transfused into a compound of oil, a change which superinduces deterioration, and is alike incident to over-heating and sudden transition from the one state to the other. No dairy should be without its *thermometer.* In every respect it is as necessary as the same simple but most useful instrument, hung up in a hothouse where grapes grow, and exotic flowers; and nothing should be left to the finger of the dairy maid, however delicate her touch, and lily her hand.

Curd.—The curding of milk should in no case be hurried. In many parts of Scotland, half an hour is the usual time allowed; while, in Cheshire, the healthful produce of the udder remains undisturbed an hour and a half, at least, after the steep has been applied. When the process is hurried, the coagulated substance becomes so tender that the separation of the whey is effected with difficulty. The curd, when lifted, is placed on a strainer full of holes, which afford a free passage to the more watery particles, separation being gently assisted by the hand. The next step, when solidity is acquired, is to pass the mass, whether large or small, two or three times through the curd-mill breaking machine, that it may be chopped equally into small pieces. This instrument forms, in England, an essential adjunct to every dairy; and it may be here remarked, that breakers of the true construction can be furnished, at a very trifling cost, by Mr William Maxwell, an ingenious mechanic, at the Lint Mill, on the estate of Closeburn.

The Cheese-Press.—The instant the curd leaves the breaker-mill, it must be well kneaded by the hand, for the purpose of expelling latent or lurking drops of whey, and reducing it to as compact a state as possible. In Scotland, after the curd leaves the cheese-vat or chessel, it is placed under some heavy weight, in many cases violently, forcibly, and too quickly. This practice, however ancient, is the reverse of scientific; and in point of fact, the slightest reflection may convince any one, that superfluous and quick pressure, in the first instance, tends to force out portions of fatty juice that would be much better retained by all who value richness of flavour, character in the market, and respectability of price. At Mr Harper's, Townfoot, and Mr Johnston's, Newton, parish of Closeburn, a light wooden press is used, of a simple construction, which we venture to recommend, previous to having recourse to heavier metal; and at both these dairies, the article produced abundantly proves that the milk of the Ayrshire cow, under skilful management, is capable of producing cheese equal to anything manufactured in England. In Cheshire, the curd is placed without a cloth in the mould or chessel; a wooden lid is laid on the top, and then gentle pressure for three hours, exactly after the fashion of the practice at Townfoot and Newton. When the press is unscrewed and the lid removed, the incipient cheese is pierced with a wooden skewer, that all the remaining whey may escape at bottom; and the hands of those in attendance, so far from being idle during this operation, are found nimbly assisting in giving it more pressure. The curd is then taken from the mould, wrapped in a clean cloth, and gently rubbed outside with finely powdered salt. Pressure succeeds, although gently at first, and the same rubbing and squeezing processes are repeated three or four times over, at intervals of about every five hours, additional pressure being employed on each occasion, until the article is finally withdrawn from the mould, and duly seasoned. In Cheshire, scarcely any salt is mixed with the curd, from the opinion that it tends to sharpen over-much the taste; while, by repeated rubbing outside, the same end is attained, so far as curing goes, and the disadvantages incident to the Scotch practice avoided. Removed from the press, the cheese is placed on a flat stone, kept in a cool place, roomy enough for holding six or seven, and sprinkled plentifully with salt on top, as well as on the floor fixture. The cheese is daily turned—its bottom put uppermost, and salt laid on it. When the first supply melts, the stone receives additional sprinkling. In the case of a large cheese, the imbibing process occupies a week or ten days, or even longer.

Seasoning Cheshire Cheese.—After the cheese is well salted in the manner described, it is carefully washed with warm water or whey and dried with a cloth. It is then carried to the kitchen, and placed on a shelf within two yards or so of the chimney fire, where it remains a fortnight, until deposited in the cheese-room, an apartment which should be perfectly free from damp. A good article will always feel a little greasy to the touch. Seasoning is a matter of great importance; and, by greater attention to this department, the salted produce of the home dairy might be brought to bear exportation by sea in the warmest weather, an experiment considered hazardous at present, the sponginess and softness that wait on marine influence, forming too often the penalty of indifferent curing.

Colouring Cheese.—Although cheese in Cheshire has long been coloured with *annatto*, and other dyeing substances, the practice has been found hurtful to the stomach of the consumer, and wasteful to the maker. All vegetable substances used to dye cheese, contain astringent ingredients, and necessarily lessen the quantity of curd. Such as still adhere to use and wont, simply do so to please their customers, and, with hardly an exception, take care to banish dyed slices from their own tables. A public spirited country gentleman of that county (G. Wilbraham, Esq.), with the view of putting an end to the mingling of deleterious drugs with wholesome food, lately offered a reward of L.20 to any one who would write such an essay on the subject as would have the effect of exploding, not merely a popular, but a pernicious error. Accordingly, a pamphlet speedily appeared from the pen of Mr George Whitley, in which the subject is ably sifted, and the use of colouring matter denounced and discouraged.* Among other objections, the following are prominently stated: first, that the colouring drugs in question, diminish the quantity of curd obtainable by the steep, from any given quantity of milk; secondly, that from the same cause the ripening process is more or less retarded; and, lastly, that the drug which takes the name of annatto dye, so extensively used, is an adulterated compound, which poisons rather than improves the finest cheese.

In submitting these hints on the improvement of dairy husbandry in Scotland, it may be added that the opinion is becoming more and more general, that the Ayrshire breed of cows is superior to any other in our island, *qua* the pastures, the byre, and the milk-house. In size and weight, they suit the grass enclosures of Scotland, but especially of such districts as Ayrshire, Lanarkshire, Dumfriesshire and Galloway, where such herbage as best suits dairy stock abounds. They are easily fed, and, in proportion to bulk, give more milk than any other. Already, as milkers, they have supplanted, to a great extent, all the other kinds in the county from which they take their name, and are creeping fast over Dumfriesshire and Galloway. Galloways, as beefers, are excellent stock; but we have known many instances in which Ayrshires of the same age and size attained, to a nearness, kindred weights. Two-years-olds of this breed, will give the same price as Galloways of the same age.—*Dumfries and Galloway Courier, July* 11, 1842.

II. *Mortality among Leeches during Storms.*—That atmospheric changes have a remarkable influence on leeches is a well-known fact. Last summer, M. Derhelms, of St Omer, ascribed the almost sudden death of them, at the approach of, or during storms, to the coagulation of the blood of these creatures, caused by the impression of the atmospheric electricity. This opinion, which was at that time the result of theory, he confirmed during the present summer by direct experiment.—*Gardeners' Gazette, 24th July* 1841.

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* See "Essay on Cheese Colouring, &c.," by George Whitley, of London. Published by Ridgway, London, 1841.

III. *To make a Soft Cheese. By the late Dr Jenner.*—

Would you make a soft cheese? Then I'll tell you how,
Take a gallon of milk, quite fresh from the cow;
Ere the rennet is added, the dairyman's daughter
Must throw in a quart of the clearest spring water.
When perfectly curdled, so white and so nice,
You must take it all out of the dish with a slice,
And put it 'thout breaking with care in the vat
With a cheese-cloth at bottom, be sure to mind that.
This delicate matter take care not to squeeze,
But fill as the whey passes off by degrees.
Next day you may turn it, and do not be loth
To wipe it quite dry with a fine linen cloth;
That this must be done you cannot well doubt,
As long as you see the whey oozing out.
The cheese is now finished, and nice it will be
If enveloped in leaves from the green ashen tree;
Or, what will do better, at least full as well,
In nettles just pluck'd from the bank of the dell.

IV. *Beer and Porter.*—The Egyptians have the credit of being the first inventors of beer; they called it the Pelusian liquor, because it was first made at Pelusium, a city near the mouth of the Nile, about 1200 years before the Christian æra. The porter, for which London has become so distinguished, was first introduced about the year 1730. Previous to that time, the malt liquors in general use were ale, beer, and two-penny: it was then customary to call for a pint of half-and-half, that is, half beer and half two-penny; or else a pint, or tankard, of three-threads, meaning a third of ale, beer, and two-penny. Then the publican was obliged to draw from three casks to serve one customer. To avoid this trouble and waste, a brewer, whose name was Harwood, conceived the idea of making a liquor, which should partake of the united flavours of ale, beer, and two-penny; this he called entire, or entire butt beer, meaning that it was drawn entirely from one cask or butt. This liquor is now known under the name of *porter*.

V. *Jerked Beef.*—The preparation termed by us jerked beef, is, I believe, peculiar to South America; the name is probably derived from the local term *charqué*. The men whose business it is, seat themselves on low stools, and begin cutting each of the detached portions of meat into long strips, uniform in size from end to end; some cut from the large pieces, being several yards in length, and about two inches in width. To perform this operation neatly requires considerable expertness. The piece of meat is held in the left hand, and at each cut is hitched round so as to offer a new place to the knife, and in this way the strip of meat seems to unwind itself like a broad tape from a ball, till at last nothing remains. When the whole has been cut in this manner, it is allowed to hang under cover for a certain time, during which it acquires a black colour, and, owing to the heat and dryness of the air, speedily loses much of its moisture. The strips are afterwards exposed to the sun till thoroughly dried, and then being made up into great bales, strongly tied round with a net-work of thongs, becomes the jerked beef of commerce.—*Journal by Capt. Basil Hall.*

VI. *Cheese made from Potatoes.*—Cheese, it is said, of an extremely fine quality, is manufactured from potatoes, in Thuringia, and part of Saxony, in the following manner:—After having collected a quantity of potatoes of a good quality, giving the preference to the large white kind, they are boiled in a cauldron, and after becoming cool, they are peeled and reduced to a pulp, either by means of a grater or a mortar. To five pounds of this pulp, which ought to be as equal as possible, is added a pound of sour milk, and the necessary quantity of salt. The whole is kneaded together, and the mixture covered up and allowed to remain for three or four days, according to the season. At the end of this time it is kneaded again, and the cheeses placed in little baskets, where the superfluous moisture is allowed to escape. They are then allowed to dry in the shade, and placed in layers in large pots or vessels where they must remain for 15 days. The older these cheeses are the more their quality improves. Two kinds of them are made. The first, which is the most common, is made according to the proportions above indicated; the second with four parts of potatoes, and four parts of cow or ewe milk. These cheeses have this advantage over every other kind, that they do not engender worms, and keep fresh for a great number of years, provided they are placed in a dry situation, and in well-closed vessels.—*Bullet. de la Societ. d'Encourage*, p. 393.

VII. *Corn Dealers of Chartres.*—There is a corn-market every Saturday at Chartres, the most important in France, with the exception of Paris. It is worth visiting for the sake of seeing the operations of the women, to whom the entire duty of measuring the corn, delivering it to the buyers, receiving the price, and paying it over to the sellers, is confided. These women are more expressively than elegantly termed "leveuses de culs-depoche;" poche signifying in the dialect of La Beauce the sack in which the grain is brought to market. These women form an organized corporation, which has existed for several centuries. They enjoy a reputation for the strictest integrity; which is indeed sufficiently attested by the fact that the whole transactions of the market, as above stated, are intrusted to them. Nor are they under any surveillance whatever. The buyer and seller alike put implicit confidence in them. The latter, when he has pitched his corn, leaves it entirely in their hands, goes about his business or pleasure in the town, and returns in the evening to receive the amount of the sale, without making any inquiries, or taking any further trouble about it. The amount of confidence placed in the honesty of these women, and the importance of the charge confided to them, may be estimated from the fact that 10,000 quintals of corn is by no means an unusual quantity to change hands in one market-day at Chartres, the the whole of which is invariably disposed of for ready money paid on the spot.—*A Summer in Western France, by F. A. Trollope.*

QUARTERLY AGRICULTURAL REPORT.

August 1842.

Never before has it been our good fortune to record so uninterrupted a series of fine weather as has occurred during the period of the last quarter. Doubtless there have occasionally been a rainy day or two, passing showers, and even a thunder-storm, but none of these, in any instance, has had the power of *breaking* the continuance of its fineness. Nor has its fineness been of a character usually experienced in this country, that of mild and dry, and even sunny days and cool cloudy nights; for the sun, though mostly unclouded, has never felt scorching, nor has the thermometer ranged at extraordinary temperatures; on the other hand, it has exhibited the extraordinary phenomenon in this country of being nearly alike night and day, the difference, perhaps, not much exceeding 10°, that is 68° during the day, and 58° during the night. The immediate effect of this equanimity of temperature has been to assimilate our climate to that of the more happy one of England; and, indeed, to impress it with a tropical character, in which vegetation continues its functions without interruption night and day. Thus our crops have had full days of growth—full, as embracing all the twenty-four hours, —and not, as usual, days of growth and nights of interruption. It is no wonder, then, that this uninterrupted vegetation has brought plants to maturity at an early period of the season. It is rare, indeed, that we can say of the harvest nearly approaching to a termination by the middle of August, and it is not improbable that, by the end of the month, few stooks will be seen in the fields; for long days and fine weather soon put harvest work through hands. The weather, however, has been rather dry on the east coast, and the consequence has been, that the pastures there are bare and brown, the grain crops short in the straw, and the hay a very scanty crop. All these results, to their utmost extent, should not, however, be charged against the fine weather; for effects will sometimes be produced by an existing cause, whether beneficial or detrimental, to a different degree than what its own nature would warrant, in consequence of the state of things which preceded it. Thus, in autumn last, the ground was so saturated with wet in the time of wheat-seed, that no one would have been surprised to hear, during the last winter, of many of the wheat-plants having perished; and, hence upon the cold soils, upon cold clays, the wheat has proved thin on the ground. The same cause affected the clover-plants of the new grass. The food of stock was short of the demand in winter, and as the spring was somewhat late, the new grass, as well as the old, was depastured at an earlier period than vegetation was able to keep pace with; and hence the short state of the grass when the fine weather commenced, which, setting in very dry, stinted not only the pasture but the hay-crop, and, by a parity of circumstances, the straw of the grain crops too.

The wheat, though thin on clay soils, is, on the kindlier soils, as the hazel loams, thick enough, though the straw is not long; but the ears are universally observed to be long and large, and indicate prolificacy; and there cannot be a doubt that the quality of the grain will be superior to what it has been for several years past. A small addition to the quantity and quality of wheat makes an astonishing difference in the acreable value of that species of grain. A single grain additional in each ear will make a difference in the yield of the crop amounting to more than the seed; and a single pound per bushel, in addition to its weight, will give with an ordinary crop at least a dozen of loaves more per acre. The barley is a great crop on the ground, and its quality cannot fail to be fine. The oats are an excellent crop on all higher lands, and their quality must also be good everywhere. As we could never understand what is meant by an *average* crop, we cannot say whether this one is likely to fill the average gauge; but of this we feel assured in our own minds, that there is enough of corn on the ground to afford food to all our inhabitants at a moderate price.

From the excessively dry state in which the ground was at the time when potatoes were planted, it was conjectured that blanks would occur in that crop, if the idea were correct, that the sets are affected by drought; and accordingly we understand that blanks have occurred in different parts of the country, and most probably to the greatest extent where the dung was used in the rankest state. It is also stated, that though the stems of the potato are luxuriant enough, there is a smallness of produce, though the quality will be fine. Turnips will prove a much superior crop to that of last year, especially those early sown. Blanks have occurred in them in certain places, and even in some cases they have been ploughed up; but any deficiency, we are inclined to ascribe rather to the routine mode of farming practised by some farmers, which deters them following a plan in conformity to existing circumstances of drought at one time and of wet at another, and in both these circumstances the turnip crop was committed to the ground this season.

Every species of stock have experienced a depreciation of price; and such a result was no more than what might have been anticipated. For the last three years prices of stock have maintained themselves above their natural level, greatly owing to shortness of breeding, and the deficiency is now beginning to be made up. And it is not improbable that the moral effect of the new tariff may have brought about the reaction sooner than it would have of itself; that is to say, that the practical operation of the tariff will be to prevent prices rising above a certain height, and that that height will be below the prices that have rated for the last three years. All the markets have been overstocked this season, which may be greatly accounted for in the failure of the pasture in England, though the hill pasture of this country is still good. Stock cannot have laid on much condition this summer, though sheep will tallow well in proportion to their weights. Indeed, lambs are not well conditioned, having been stinted in early spring on their mother's milk. From the same cause, namely, the scanty pasturage, dairy produce has experienced a great diminution in quantity; and the consequence is, that butter has already risen to a high price in all the towns. Wool has experienced a diminution of price, which was to be looked for in the depressed state of the woollen manufactures.

Salmon has been more plentiful this season than it has been for many years. What the law is, which governs the motions of this beautiful and delicious fish, seems to be yet undiscovered. It would seem that the destruction of the spawn in the upper waters cannot have been the cause of the absence of the fish from our coasts for some years past, for the same cause should have produced the same effect this year. Is it possible that the greater number of the fish remain in deep water until a season arrives which tempts them to disport themselves near the shore? That salmon migrates we do not believe, as such a habit would be inconsistent with their well-known attachment to the rivers in which they are bred; and yet swallows and wood-cocks migrate and return again to their native haunts. Before we can allow the same sort of reasoning to account for the anomalous disappearance of the salmon, it would first require to be proved that the instincts of fishes are as acute as those of birds.

Fruit is an abundant crop, and selling at very moderate prices. Its abundance, however, is not commensurate with the immense profusion of blossom which was displayed in spring. The blossom of the older trees was destroyed by insects, and it is only the young and vigorous trees that have produced an unusual crop.

The corn-markets have experienced a gradual declension for some weeks past. The aggregate average on the 12th inst. was 63s. 3d., while the London average, for wheat, on that day, was only 55s. 11d., the weekly average of the country being 58s. 11d. No doubt the early harvest, and the fine weather which has raised a good quality and given a safe housing to the wheat, have been mainly instrumental in bringing about reduction in price; and as it is not probable that it can rise for some time to come, it is expected that all the foreign wheat in bond will be immediately entered for home consumption. The duty on import was last week 8s.; it has risen to 9s. this week, and it is confidently expected that it will rise as much as to 11s. in the week following. Those who purchased foreign grain largely at a late period, when prices abroad were not much below those of this country, will lose considerably by their speculation. They will be obliged to make virtue of necessity, and pay the new duty of 9s. or 10s., and be thankful that they can escape with the loss; for had the old law been still in operation, they could not have released their stocks under 23s. 8d. Some time must elapse ere it can be ascertained correctly how the new corn-law is to work; but, as yet, notwithstanding the agitation that has been kept alive in regard to it and against it, it seems to operate very well. It has as effectually prevented foreign competition with a duty of 8s., as the old duty of 22s. 8d. would have done; whilst the small duty will have the effect of assisting the revenue, without incurring the odium of being a permanent tax upon corn, which the same amount of fixed duty proposed by the late Ministry, would inevitably have done, unless it had been abrogated by on Order in Council, and then there would have been no fixedness in it at all—it would then have become the creature of caprice, the caprice of partizans too. There are two points of the new Corn Law which we like; the one is the retention of *the same amount of duty*, 18s., *when the wheat* is from 52s. to 55s. the quarter, and of 6s. when the price is from 66s. to 69s. per quarter, and so of barley and oats also; because these rests impose checks upon the buyers unduly depressing or elevating their market price for a time;—and the other improvement is the addition of a number of the smaller inland towns to those which return the prices; whose interference has the immediate effect of rendering any combination amongst the buyers to raise or elevate the prices nugatory; and it will also have the effect of returning the prices which are really received by the farmers, and not those merely received by the buyers, as was the case under the late law. The declaration obliged to be emitted by the buyer, that their purchases consist of *bona fide British* corn, will have a powerful effect of rendering more true returns of prices. These beneficial effects of the new law will soon be felt, inasmuch as the bonded grain would not now be released under an 8s. or 9s. duty, had it been possible now, as it formerly was, to work the averages down to the nominal duty of 1s.

We had intended to make somewhat copious remarks on the new corn-law and the new tariff, but find our space so circumscribed by the unusual length of the Highland and Agricultural Society's essays and proceedings connected with the Show, that our limits are already exhausted. We have therefore given the schedules of the new duties which affect the import of every commodity connected with agriculture without note or comment.

THE REVENUE.

***ABSTRACT** of the Nett Produce of the Revenue of Great Britain, in the Quarters and Years ended on the 5th of July* 1841, *and 5th of July* 1842,—*shewing the Increase and Decrease on each head thereof.*

	Quarters ended July 5.		Increase.	Decrease.	Years ended July 5.		Increase.	Decrease.
	1841.	1842.			1841.	1842.		
	£	£	£	£	£	£	£	£
Customs, ...	4,848,586	4,422,191	. .	426,395	19,410,877	19,449,735	38,858	. .
Excise, ...	2,795,312	2,890,100	94,788	. .	12,613,397	12,55[illegible],397	. .	54,000
Stamps, ...	1,680,821	1,698,379	17,558	. .	6,706,288	6,649,087	. .	57,201
Taxes, ...	2,030,696	2,059,239	28,543	. .	4,372,319	4,440,162	67,843	. .
Post-Office, . .	119,000	154,000	35,000	. .	433,000	539,000	106,000	. .
Miscellaneous,	48,235	243,757	195,522	. .	251,680	747,327	495,647	. .
	11,522,650	11,484,716	371,411	426,395	43,787,561	44,384,708	708,348	111,201
	Deduct Increase,			371,411	Deduct Decrease,		111,201	
	Decrease on the Qr.			54,984	Increase on the Year,		597,147	

TABLES OF PRICES, &c.

The Average Prices of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets:—

LONDON.

Date.	Wheat. s.	d.	Barley. s.	d.	Oats. s.	d.	Rye. s.	d.	Pease. s.	d.	Beans. s.	d.
1842.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
May 6.	62	1	28	5	20	9	32	6	30	8	31	5
13.	62	4	27	1	19	9	31	4	31	6	31	9
20	61	10	27	2	19	9	32	2	31	8	29	6
27.	64	6	27	1	19	3	32	10	30	10	32	2
June 3.	64	5	27	10	19	4	33	6	31	4	31	1
10.	66	5	27	8	20	8	32	2	32	[illegible]	31	5
17.	64	10	27	11	21	7	33	4	33	4	33	8
24.	65	11	28	4	21	1	34	6	34	6	32	11
July 1.	65	10	27	8	22	7	32	8	35	2	34	2
8.	64	10	27	10	22	10	31	6	35	8	33	8
15.	66	6	28	0	21	9	36	4	35	0	33	5
22.	66	1	27	11	20	11	34	8	34	8	34	6
29.	67	10	27	7	20	6	35	0	33	9	33	10

DUBLIN.

Date.	Wheat per Bar. 20 St. s.	d.	Barley per Bar. 16 St. s.	d.	Bear per Bar. 17 St. s.	d.	Oats per Bar. 14 St. s.	d.	Flour per Ba 9 St. s.	d.
1842.	s.	d.	s.	d.	s.	d.	s.	d.	s.	
May 6.	32	1	18	6	15	4	13	5	21	3
13.	31	2	16	6	15	0	18	1	21	2
20.	32	2	17	1	14	8	13	8	21	1
27.	30	2	18	6	15	6	14	5	20	9
June 3.	35	7	19	7	13	8	13	6	21	8
10.	34	7	19	10	16	0	15	5	21	8
17.	32	6	20	2	16	2	13	4	21	[illegible]
24.	32	0	19	6	15	10	15	2	21	6
July 1.	30	10	19	8	15	7	14	7	21	4
8.	31	2	20	4	15	4	14	10	21	[illegible]
15.	31	8	20	6	14	6	14	2	21	[illegible]
22.	28	10	20	8	13	6	13	7	21	7
29.	30	8	20	6	14	6	14	6	21	4

LIVERPOOL.

Date.	Wheat. s.	d.	Barley. s.	d.	Oats. s.	d.	Rye. s.	d.	Pease. s.	d.	Beans. s.	d.
1842.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
May 6.	54	2	31	8	20	9	31	6	31	6	34	1
13.	53	1	32	7	20	0	31	2	31	9	34	8
20	55	8	28	9	19	0	31	4	33	2	38	6
27.	56	1	30	0	20	6	32	6	34	6	37	0
June 3.	61	6	30	8	21	1	32	8	35	6	36	3
10.	58	1	31	10	21	4	33	2	36	4	36	1
17.	57	2	30	5	23	7	33	8	36	6	36	3
24.	61	5	31	8	24	2	34	2	36	2	37	4
July 1.	57	4	28	6	21	3	34	6	36	9	37	8
8.	58	6	29	6	21	4	35	2	35	2	36	8
15.	56	5	29	7	21	4	34	8	34	2	34	6
22.	61	0	31	0	20	7	34	2	33	8	36	1
29.	56	10	27	9	21	4	33	8	35	2	37	10

EDINBURGH.

Date.	Wheat s.	d.	Barley s.	d.	Oats. s.	d.	Pease s.	d.	Bean s.	d.
1842.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
May 4.	62	6	29	0	23	2	32	6	33	[illegible]
11.	61	6	29	6	23	0	32	6	32	10
18.	62	6	29	8	23	2	33	0	33	2
25.	63	6	29	6	24	0	32	8	34	[illegible]
June 1.	65	0	31	6	24	6	34	4	33	2
8.	66	0	31	6	25	4	34	6	35	[illegible]
15.	66	2	32	0	25	10	37	0	37	6
22.	65	0	32	1	25	6	37	2	37	4
29.	64	6	32	0	25	3	36	0	36	2
July 6.	64	6	32	6	26	4	36	2	36	8
13.	64	0	32	8	27	0	36	0	35	4
20.	63	6	32	9	26	4	33	6	34	0
27.	62	6	32	7	26	0	33	8	34	2

TABLE shewing the Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. IV. c. 58, and 5th Vict. ch. 14, and the Aggregate Averages which regulate the Duties payable on FOREIGN CORN: the Duties payable thereon, from May 1842 to July 1842.

Date.	Wheat.						Barley.						Oats.						Rye.						Pease.						Beans.					
	Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.	
1842.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d	s.	d.	s.	d.	s.	d.	s.	d.	s.	d
May 6.	60	8	59	[illegible]	13	0	27	4	26	11	10	0	19	9	19	8	7	0	32	8	32	8	10	6	30	7	30	7	10	6	31	8	30	9	10	[illegible]
13.	59	9	60	0	12	0	26	3	26	11	10	0	19	6	19	3	7	0	31	3	32	5	10	6	31	3	30	10	10	6	31	9	31	0	10	[illegible]
20.	60	9	60	5	12	0	25	11	26	10	10	0	19	5	19	4	7	0	32	4	32	2	10	6	31	4	31	1	10	6	31	7	31	4	10	[illegible]
27.	61	10	60	9	12	0	25	11	26	9	10	0	19	7	19	5	7	0	33	7	32	4	10	6	30	11	31	2	10	6	32	1	31	7	10	[illegible]
June 3.	63	6	61	3	11	0	26	6	26	7	10	0	19	7	19	6	7	0	35	6	32	5	10	6	32	5	31	5	10	6	32	5	31	10	10	[illegible]
10.	64	0	61	9	11	0	26	8	26	5	10	0	20	6	19	8	7	0	31	9	32	5	10	6	32	7	31	6	10	6	33	1	32	1	10	[illegible]
17.	63	10	62	3	10	0	26	10	26	4	10	0	21	6	20	0	6	0	36	10	33	3	9	6	32	6	31	10	10	6	33	9	32	5	10	[illegible]
24.	63	11	63	0	9	0	27	6	26	7	10	0	21	7	20	4	6	0	31	7	33	3	9	6	33	2	32	2	10	6	34	4	32	11	10	[illegible]
July 1.	64	3	63	7	9	0	27	7	26	10	10	0	22	4	20	10	6	0	32	3	33	3	9	6	35	6	32	10	10	6	34	9	33	5	9	[illegible]
8.	64	10	63	10	9	0	27	5	26	10	10	0	22	2	21	2	6	0	29	5	33	2	9	6	31	0	33	2	9	6	35	1	33	9	9	[illegible]
15.	65	8	64	5	8	0	28	0	27	4	9	0	22	0	21	8	6	0	38	6	33	5	9	6	33	5	33	10	9	6	34	10	34	4	8	[illegible]
22.	65	4	64	7	8	0	27	10	27	6	9	0	21	6	21	10	6	0	36	5	34	2	8	6	34	0	34	1	8	6	35	1	34	8	8	[illegible]
29.	63	9	64	6	8	0	28	0	27	9	9	0	21	5	21	10	6	0	34	9	33	10	9	6	33	10	34	4	8	6	34	7	34	9	8	[illegible]

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the Quantities of Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; the Quantities upon which duties have been paid for home-consumption, during the same Month; and the Quantities remaining in Warehouse at the close thereof, from 5th May 1842 to 5th July 1842.

Month ending	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN WAREHOUSE.		
	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.
May 5. 1842.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu	Qrs. Bu
Wheat, . .	152,870 4	1,776 0	154,646 4	5,384 6	10,347 2	15,932 0	801,753 1	3,572 3	805,325 4
Barley, . .	2,365 0	. .	2,365 0	737 3	. .	737 3	72,361 7	. .	72,361 7
Oats, . . .	8,802 1	. .	8,802 1	278 6	. .	278 6	97,462 4	. .	97,462 4
Rye, ...	1,008 4	. .	1,008 4	512 4	. .	512 4	2,777 5	. .	2,777 5
Pease, . . .	3,687 5	0 1	3,687 6	96 0	15 5	111 5	26,846 4	2,679 3	29,525 7
Beans, . .	1,840 6	. .	1,840 6	9 7	. .	9 7	53,713 2	. .	53,713 2
Totals,	170,574 4	1,776 1	172,350 5	7,249 2	10,362 7	17,612 1	1,054,914 6	6,251 6	1,061,166 5
June 5. 1842.									
Wheat, . .	237,353 5	2,950 4	240,304 1	76,546 6	5,338 5	81,885 3	983,571 7	1,184 2	984,756 1
Barley, . .	3,628 3	. .	3,628 3	1,321 2	. .	1,321 2	73,974 2	. .	73,974 2
Oats, . . .	8,254 1	. .	8,254 1	9,776 6	. .	9,776 6	90,928 5	. .	90,928 5
Rye, ...	715 2	. .	715 2	237 7	. .	237 7	3,255 0	. .	3,255 0
Pease, . . .	7,835 2	. .	7,835 2	774 1	455 3	1,229 4	33,607 0	2,224 0	35,831 0
Beans, . . .	7,171 1	. .	7,171 1	529 3	. .	529 3	60,168 5	. .	60,168 5
Totals,	294,957 6	2,950 4	297,908 2	89,186 1	5,794 0	94,980 1	1.255,500 3	3,408 2	1,258,906 5
July 5. 1842.									
Wheat, . .	233,129 5	277 4	233,407 1	104,622 6	1,035 7	105,658 5	1,158,225 6	467 2	1,158,693 0
Barley, . .	7,677 2	20 2	7,697 4	2,233 4	20 4	2,260 0	79,098 2	. .	79,098 2
Oats, . . .	28,869 6	. .	28,869 6	6,899 2	. .	6,899 2	110,663 4	. .	110,663 4
Rye, ...	99 3	. .	99 3	475 3	. .	475 3	2,585 2	. .	2,585 2
Pease, . . .	10,179 1	556 3	10,735 4	1,297 6	1,574 2	2,872 0	42,409 4	1,236 6	43,616 2
Beans, . .	4,208 6	. .	4,208 6	504 3	. .	504 3	63,043 2	. .	63,043 2
Totals,	334,163 7	854 1	335,018 0	115,839 0	2,630 5	118,669 5	1,456.025 4	1,674 0	1,457,699 4
May 5. 1842.	cwt. qr. lb.	cwt. qr. lb	cwt. qr. lb	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb	cwt. qr. lb.	cwt. qr. lb	cwt. qr.
Flour, . . .	27,605 2 27	2,186 2 10	29,789 1 9	3,824 2 0	83,394 1 12	87,218 3 12	307,515 0 8	59,616 3 10	367.131 3
Oatmeal, .	15 1 2	. .	15 1 2	. .	200 0 25	200 0 25	36 0 20	932 1 4	968 1
Totals,	27,618 0 1	2,186 2 10	29,804 2 11	3,824 2 0	83,594 2 9	87,419 0 9	307,551 1 0	60,549 0 14	368,100 1
June 5. 1842									
Flour, . . .	52,045 2 5	9,180 1 1	61,225 3 6	28,281 3 6	56,999 1 26	85,281 1 4	328,685 0 25	11,949 1 5	310,643 2
Oatmeal, .	. .	. .	. .	. .	327 0 13	327 0 13	20 3 18	603 0 19	626 0
Totals,	52,045 2 5	9,180 1 1	61,225 3 6	28,281 3 6	57,326 2 11	85,608 1 17	328,706 0 15	12,554 1 24	311,269 2
July 5. 1842									
Flour, . . .	36,241 2 12	55,605 1 6	91,846 3 18	41,547 1 8	58,165 2 10	102,712 3 18	309,093 2 16	9,873 2 8	318,967 0
Oatmeal, .	30 1 11	2,295 2 21	2,325 3 23	. .	1977 1 8	1,977 1 8	20 2 6	923 1 12	943
Totals,	86,271 3 23	57,900 3 18	94,172 3 13	41,547 1 8	60,142 3 18	104,690 0 26	309,114 0 22	10,796 3 20	319,911 0

PRICES of BUTCHER-MEAT.

	LONDON, Per Stone of 14 lb.		MORPETH, Per Stone of 14 lb.		EDINBURGH, Per Stone of 14 lb.		GLASGOW, Per Stone of 14 lb.	
Date	Beef.	Mutton	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
1842.								
May	7/3 to 7/9	7/6 to 8/	7/ to 7/6	7/3 to 7/9	7/ to 7/6	6/6 to 7/6	7/3 to 7/9	6/9 to 7/9
June	7/6 8/	7/3 7/9	7/3 7/9	7/ 7/6	7/ 7/9	6/9 7/6	7/3 7/9	6/9 7/6
July	7/6 7/9	7/6 7/9	7/3 7/9	7/ 7/9	7/3 7/9	7/ 7/6	7/3 7/9	7/ 7/9

PRICES of English and Scotch WOOL.

English, per 14 lb.			Scotch, per 14 lb.		
Merino, ...	15/6 to	18/	Leicester, Hogg, . .	14/ to	17/
in grease . . .	12/6	15/	Ewe and Hogg, . .	13/	14/6
South Down, . .	13/6	16/	Cheviot, white, . . .	11/	14/6
Half Bred, . . .	12/	14/	Laid, washed, . .	8/	10/
Leicester, Hogg . .	15/	18/	unwashed, . .	6/	7/6
Ewe and Hogg, . .	12/6	16/	Moor, white, . . .	6/	7/
Locks, ...	6/	7/6	Laid, washed, . . .	5/	6/
Moor, ...	6/	6/6	unwashed . .	4/	5/

THE

QUARTERLY

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WOOD-PAVING AND STEAM-CARRIAGES ON COMMON TURNPIKE ROADS.

THE invention of the steam-engine is one of the very few events of the like nature, the importance of which has not been over-estimated. Scarcely any application of steam-power has been attempted without proving more or less successful; scarcely anything has been predicted of it which has not been realised. At once of enormous power and singular ductility,—alike capable of impelling a navy, and of assisting in the most minute and delicate operations of the factory,—it seems to have all the excellencies that can well be expected in a moving agent. Undoubtedly, one of its most important applications—one which has had most influence on the general comfort and conveniences of society,—has been to railroad conveyance. Perhaps it is the very success of these undertakings (for they have been perfectly successful in all that depended on the instrumentality of steam) that has been the means of diverting the public mind, for a time, from the other advantages of a corresponding nature, to be derived from the use of this locomotive agent. They are pausing on the eminence that has been gained,—contemplating the victory that has been won, rather than looking forward to new triumphs. But this feeling will soon pass away; and when due attention is again exerted to extend the utility of this mechanical power, we feel persuaded that an application will speedily be made of it, which will bring it more closely home to our doors, and make it enter more largely into the ordinary business of life. We mean that it will be employed as a means of draught on common roads, and that this will be brought about by the introduction of wood-paving.

It is well known that numerous experiments were made many years ago, as to the practicability of employing steam-carriages on common roads, *formed as these roads are at present;* but it is perhaps not so generally known what degree of success attended these experiments, even at that comparatively early period. It appears from the report of a Parliamentary Committee in 1831, founded on the evidence of the principal scientific mechanicians and engineers of the day, and deduced from a series of trials, which leave no doubt of the perfect accuracy of the conclusions, 1. That carriages can be propelled by steam on common roads at an average rate of ten miles per hour; 2. That, at this rate, they have conveyed upwards of fourteen passengers; 3. That their weight, including engine, fuel, water, and attendants, may be under three tons; 4. That they can ascend and descend hills of considerable inclination with facility and safety; 5. That they are perfectly safe for passengers; 6. That they will become a speedier and cheaper mode of conveyance than carriages drawn by horses; 7. That they are not, or need not be (if properly constructed) nuisances to the public; 8. That they admit of greater breadth of tire than other carriages; and as the roads are not acted upon so injuriously as by the feet of horses in common draught, such carriages will cause less wear of roads than coaches drawn by horses. The Committee further state, that their inquiries have led them to the belief, "that the substitution of inanimate for animal power, in draught on common roads, is one of the most important improvements, in the means of internal communication, ever introduced. *Its practicability they consider to have been fully established;* its general adoption will take place more or less rapidly, in proportion as the attention of scientific men shall be drawn by public encouragement to further improvement." The several witnesses have estimated the probable saving of expense to the public, from the substitution of steam-power for that of horses, at *from one-half to two-thirds.* Mr Farey gives as his opinion, " That steam-coaches will, very soon after their first establishment, be run for one-third of the cost of the present stage-coaches."

These statements, emanating from such a quarter, and given authoritatively as the result of an extensive and pains-taking investigation, may naturally suggest the inquiry how it has happened that, with all these alleged advantages, steam-carriages have not come into general use on common roads? Many reasons may be assigned for this. One of them has been already alluded to, namely, that the public mind has, for some time, been so engrossed with railroad conveyance, that the advantages of other modes of transit by steam-power have not received a due share of attention: it is the inseparable attribute of every species of mania to be strictly exclusive. Neither are the benefits here held out, important as they are, of such a striking and remarkable character as irresistibly to claim public notice. We have become so accustomed to extraordinary results from the agency of steam, that we are scarcely disposed to look upon them with favour, unless they partake somewhat of that character; and if it happen that, in order to obtain even moderate advantages, long established and extensive usages require to be abandoned, the probability is, that things will be allowed to remain as they are. It appears too, from the evidence, and the same thing will occur to any one on a moment's reflection, that it is only on comparatively level and well-paved roads, that the introduction of steam-carriages could be safely accomplished; and even these, according to the opinion of one of the ablest judges, it would be necessary *to harden by some means or other during the winter.* When to these considerations we add the great inequalities of surface resistance on ordinary roads, presenting an obstacle which must ever prevent the attainment of great velocity, we perceive sufficient reasons, without adducing others, for steam-carriages having hitherto failed to supersede the usual modes of conveyance on turnpike roads.

But every one who has paid any attention to the subject at once concurs in the opinion, that all difficulties would be instantly removed by the adoption of wood-paving. Originally introduced without any special reference to the employment of locomotive carriages, this mode of road-making is peculiarly adapted to them, and would confer upon them nearly all the advantages of a railroad, while their ordinary uses would not be interfered with. Indeed it is impossible to consider the two inventions in connection, without being at once struck with the fitness of the one for bringing out the advantages of the other. Engineers of the highest eminence speak on the subject with the most entire confidence; and in a trial made in London in the spring of the present year, by Mr Squire, he found that, while his steam-carriage could move on the best macadamized road only at the rate of fifteen miles an hour, the greatest difference was immediately perceptible on coming to the wooden pavement; and he declared that, on such roads, he would have no difficulty in keeping up an average velocity of thirty miles an hour.* "My entire conviction is," says Mr Worsley, an amateur of great knowledge and experience, "that the only real difficulty arises from the great inequalities of surface resistance on ordinary roads. In the hope of finding a remedy for this evil, I have carefully watched the various systems of pavements, which, during the last few years, have been tried in London, and have had my eye on the Count de Lisle's since the day on which the first block was laid down in Whitehall. I think it a most ingenious invention, and incomparably the best pavement yet known. It presents a firm, even, elastic, and continuous surface; is many degrees easier of draught than the very best macadamised road; is not liable to alteration by change of weather, and is free from mud in winter, and dust in summer. The sun, the frost, and the rain, the three great agents of destruction on ordinary roads, are equally innocuous to it, and from its introduction on the common road, I at once foresee the removal of all the real difficulties opposed to steam-locomotion. This paving, indeed, would, on the undulating surface of the country, be infinitely preferable to the iron railroad itself, inasmuch as the tough and fibrous texture of the wood presents a surface singularly adapted for giving the requisite *bite* to the tangent point of the wheel. Its yielding surface, too, would afford a valuable aid to mechanical power, by materially diminishing the vibration consequent on the concussion of hard surfaces, and thus removing the great cause of wear and tear on the rail and ordinary roads. Such is found to be the case in America, where, on many of the railroads, the wooden is substituted for the iron train, without causing any diminution of velocity."

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* On the Use of Mechanical Power in Draught on Turnpike Roads, &c., by J. L. Kettle, Esq., a well digested pamphlet, which has supplied us with the above and many other interesting facts bearing upon the subject.

The same statements may be confirmed by the testimony of many other competent judges, but it is unnecessary to bring that forward in this place. It may be fairly assumed as having been proved that wood-paving is admirably adapted for steam-locomotion; and it therefore becomes a most interesting and important inquiry whether it can be laid down on public roads to such an extent, and under circumstances sufficiently advantageous, to give it a decided preference over the present methods. This, we think, must be answered in the affirmative. The plan seems perfectly practicable; and not only would its adoption secure the immense advantages of steam-draught, but roads so paved would be better adapted for every other purpose that is now required of them.

The history of wood-paving in this country is, we suppose, pretty generally known; and such as require ample information on the subject, may be referred to an interesting treatise by J. Lee Stevens, on wood-paving in London. It is said that the first public communication on the subject was made by Mr John Finlayson of Ayr, the inventor of many useful agricultural implements. This appeared in the London Journal of Arts and Sciences for March 1825. He made an experiment to test the durability of blocks of wood used as pavement, and found that, *after the lapse of twenty-five years*, the wood was more perfect than the granite among which it was inserted, the former continuing more flush and prominent, than any other part of the causeway that surrounded it. He raised some of the wooden blocks, expecting them to have undergone considerable decay, but found the wood *quite as fresh as on the day it was laid*. Various trials of more or less importance were made not long after, chiefly in London, as the impression then was, and is very generally so still, that it wa only to street-pavement that the scheme was applicable. In briefly mentioning some of the more recent methods, and their chief peculiarities, availing ourselves for this purpose of Mr Steven's experience, the precedence, in point of time, must be given to Mr Stead, who commenced his labours in 1838, and laid his specimens in numerous parts of the metropolis. His theory was, that the water should be permitted to percolate through the blocks, as well as through the substratum by which they were supported. He seems to have been ultimately convinced of the fallacy of this system, as far as regards the last mentioned particular, for he at last had recourse to a foundation of Roman cement and Thames ballast, a concrete forming a very firm substratum. His blocks were six-sided, but one had no connection with another save by juxta-position ; there being thus no principle of cohesion, each had to sustain the entire pressure downwards without receiving aid from the others, the consequence of which was, that they were liable to be forced through the substratum, and the uniformity of the surface impaired. The next system, in point of time, is that of the Count de Lisle, adopted by the metropolitan company ; but as it is the system by far best adapted for general use, before speaking of it in detail, a brief reference may be made to such others as have been received with some degree of favour. Mr Carey's method includes no provision for a concrete foundation. The blocks have not a perfect cohesion with each other ; and they are placed vertically, a position in which the fibre is most liable to give way. The blocks are of a cubical form, parallel at the base and surface, and alternately concave and convex at the sides, but not sufficiently so to distribute the pressure equally, and prevent individual blocks from subsiding below the general level. Mr Grimman adopted blocks which were parallelograms at the base and surface, and at the ends and sides they were made to incline at an angle of 77 degrees. They were so cut as to be worked from left to right, and from right to left, presenting a sort of herring-bone surface, such as may be seen in many old stables floored with brick. Each block leant endwise and sidewise on two others, and was similarly leant upon, so that the distribution of the pressure was not unequal. The inclination of the woody fibre was a great recommendation to this system, but it was destitute of any principle of cohesion, and was liable to be forced up by the expansion. Mr Rankin's system is a great deal more complex than any of the above, and we must, therefore, refer for a description of it to the work formerly mentioned.

The Count de Lisle places his blocks on a substratum of the strongest description; a concrete composed of blue lias lime, a peculiar metallic sand, and Thames ballast, which becomes permanently solid and impervious a few days after it is formed. "Cohesion," says Mr Stevens, "is effected in his system by a mode equally scientific and simple. The blocks, six inches deep, and six inches square at the base and top, are parallelopipeds, which, on two parallel sides, are perfectly vertical, and on the other two incline at an angle of 63 degrees, 26 minutes, 5 seconds, and 8-10ths of a second, being the precise angle obtained by a process termed by the inventor the stereotomy of the cube. The blocks are cut and drilled by machinery mathematically alike, and are so placed in the street, that the blocks rest upon and are supported by each other from kerb to kerb, each alternate course having the angle of inclination in opposite directions. These courses are connected to each other, side and side, by dowels, which dowels occupy the exact centres of two isosceles triangles into which each block is divisible. This arrangement affords the means of connecting every block with four others, and prevents the possibility of one being forced below the level of another. Pressure and percussion are therefore distributed in effect over large surfaces, and a perfect cohesion established. Nor is this cohesion advantageous only as a means of resistance against superincumbent force. It is of equal value in withstanding any effort to break up the uniformity of surface by undue expansion. The concrete foundation having a slight elliptical curve given to it, and the wood-paving being so laid as to correspond with that curve, for the purposes alike of strength and surface drainage, there is naturally a slight tension on the dowels in an upward direction, which the pressure from above tends to relieve; whilst the lower ends of the blocks abut so closely together in one direction, and every block is so kept in its position by two dowels on each side, in the other direction, that the whole mass will take an increased curve consequent upon expansion, without the slightest risk of either partial or general displacement."

Greater facility in laying down this pavement was afterwards attained by dowelling the blocks together at the manufactory, in panels of 24 each, the blocks at the sides being connected together with iron cramps. Trying this system, therefore, by all the tests applicable to such a case, substratum, cohesion, construction, position of fibre, &c., it makes the nearest approach to fulfilling all the requisite conditions. It has also been most extensively subjected to the test of experience, and has fully answered all the expectations that were formed of it. The following is a summary of the quantities of the different kinds of wood-paving laid down in London by the close of last year, and the table subjoined affords a comparative view of their respective merits :—

	Sq. Yards.
Mr Stead's Hexagons, ...	8710
Metropolitan, Count de Lisle's, . . .	19,838
Mr Carey's, ...	1750
Mr Grimman's, ...	650
Mr Rankin's, ...	492
Total yards, .	31,440

Description.	Substratum.	Cohesion.	Mode of laying down and removal.	Grooving.	Position of Fibre.	General Structure.
STEAD.	Good.	None.	Simple.	Imperfect.	Bad.	Indifferent.
DE LISLE.	Superior.	Complete.	Expeditious.	Sufficient.	Good.	Good.
CAREY.	None.	Partial.	Simple.	Imperfect.	Bad.	Indifferent.
GRIMMAN.	Good.	Partial.	Simple.	Imperfect.	Good.	Indifferent.
RANKIN.	Good.	Incomplete.	Complex.	Excessive.	Good.	Fragile and Indifferent.

The following are the rates of charge made by these different parties, in the order in which they stand in the above table :—For blocks of 6 inches depth, 9s. per yard, and 2s. per yard for concrete : 13s. per yard for 6 inch blocks and concrete complete, and 6d. per yard per annum for keeping in perfect repair for terms of 10 or 21 years ; 12s. in full for 5-inch blocks, 11s. for 4-inch blocks, and proportionally for repairs : for blocks of 8 inches in depth, 12s. 6d., 9 inches 13s. 6d., and 10 inches 14s. 6d. : with Roman cement concrete 12s. per yard : 16s. per yard, concrete included.

It will thus be seen that the Count de Lisle's system has a decided advantage above every other, and that almost in every particular, and should therefore be adopted in every attempt to give further extension to wood-paving. The method on which it proceeds of uniting the blocks in bundles, and these again with each other, is of great importance, not only towards the compactness and uniformity of the structure, but, as it appears to us, in an economical point of view. For, by this mode of proceeding, the size of the blocks would become of comparatively less importance, and thus a species of timber might be employed of less value, and procurable in greater quantities. It is found that blocks 6 inches deep are capable of sustaining the traffic of the most crowded thoroughfares of London ; for provincial towns and roads it is obvious that smaller dimensions would be sufficient ; 5-inch blocks, or even shorter ones, would answer the purpose. Neither is it necessary that the diameter of the blocks should be great, probably blocks of a few inches diameter would suffice. Now all experience goes to prove that the wood best adapted for the purpose of paving, is larch and Scotch fir, and they are best when laid down quite full of sap, immediately after being cut. The best materials, therefore, are just those which Scotland is most fitted to supply, and a ready demand would thus be opened up for what is at present of but little value to proprietors. Should blocks of small diameter be found to answer, as there is reason to believe they would, comparatively young wood, which, in want of more worthy applications, is now employed for paling, firewood, &c., could be made available for this important end. Vast tracts of land now nearly barren, but extremely well-adapted for the growth of the Scotch fir, might be planted, and would soon afford an inexhaustible supply.

When, to the other manifold advantages of wood-paving, it is added that it is *cheaper* than any other now in use, a very strong case will be made out in its favour. Notwithstanding the extra expense which usually attends a new operation, it can be laid down in the streets of London for a smaller sum than granite paving, and is considerably lower than macadamization, the most expensive of all modes of road-making. The following is a comparative statement of the cost of granite and wood-paving for the Strand, in the parish of St Mary le Strand, for twenty-one years.

Cost of Granite Paving, taking an average of the last seven years :

Granite Paving and Concrete, per yard, ...	L.0 12 6
Average repairs for seven years, 3d. per yard, . . .	0 1 9
	L.0 14 3
Deduct the value of the stone for streets of lesser traffic,	0 3 0
Actual cost for seven years, . . .	L.0 11 3
Multiply by three to cover twenty-one years,	0 0 3
Actual cost for twenty-one years, . .	L.1 13 9

Wood-Paving, with Concrete.

Cost per yard, ...	L.0 13 0	
Twenty-one years repairs at 6d., ...	0 10 6	
	L.1 3 6	
Deduct value of wood-paving for streets of lesser traffic, ...	0 3 0	
		1 0 6
Saving per yard in twenty-one years, .		L.0 13 3

"Compared with the macadamized portions of Oxford Street, Piccadilly," says Mr Stevens, "and other places of equal traffic, the economy of wood-paving is as prominently evident. These cost at present from 2s. 6d. to 3s. per yard, per annum, to keep in repair, to say nothing of their first construction; and the wood-paving, for terms of twenty-one years, can be laid down, and kept in perfect repair, at an annual charge or rental of 2s. 3d. per yard—being a saving of from 10 to 30 per cent. per annum."

On ordinary roads, where the traffic is comparatively small, wood-paving might be laid down in a very economical manner; and, if intended for steam-carriages alone, it will seldom be found necessary to cover more than a portion of the road with wood. "In ordinary cases, the wood will probably be laid either at the side, or in the middle of the road, so as to be available for every class of carriage, whether propelled by steam or horse-power. But, where there may be sufficient space for the purpose, it may occasionally be advisable to devote a part of the road exclusively to the steamers; in which cases, as there will be neither danger to, nor impediment from, other traffic, a degree of velocity may be attained scarcely surpassed, perhaps, by that on the railroads themselves. In the formation of these exclusive lines, a great saving may be effected by laying down the wood in parallel lines, or trams, two feet wide, and from three to four feet apart, the total cost of which (even if it should be thought advisable to lay the concrete substratum in the intervening space between the lines, as well as under the blocks,) will not exceed 17s., the lineal yard, or L.1500 per mile, for a single line of road. The cost of a double line will, of course, be proportionably increased, while the amount of repairs will, in the one case, be about L.22, in the other L.44 annually. Where, however, it is intended that the wooden road shall be open to every kind of carriage, though the train system may still be adopted with advantage, and at a considerable saving of expense, still it will generally be found preferable to form a single line, varying in width from seven to fourteen feet, and, in the first cost, from L.2300 to L.4600 a mile, according to the amount of traffic, and consequent capability of bearing expense. Or, if these several charges should be commuted for equivalent annual payments, the yearly cost per mile, for the formation and maintenance of the single tram-road, will be about L.180, and of the double tram, L.360; while that of the single line, if seven feet wide, will be less than L.300, and, if fourteen feet wide, than L.600 per annum. Such charges are wholly insignificant when compared with the enormous cost of the railroads, averaging from L.30,000 to L.40,000 per mile for their original construction, and requiring for their maintenance and management an annual expenditure of an immense amount, exceeding, on some of the lines, L.2000 a mile."*

The above statements will enable the reader to form an intelligent opinion on this interesting subject. They fully, we think, bear out our former assertion, that the introduction of steam-power on ordinary roads, in connexion with wood-paving, is a measure perfectly practicable, while the advantages attending it are so obvious and important that it is unnecessary to insist upon them. Every one is acquainted with the present state of the turnpike trusts. In 1839 no less a sum than nine millions of money was invested in them, and this was annually increasing at the rate of more than 11 per cent., owing to the necessity of converting unpaid interest into capital. Some redeeming measure seems, therefore, indispensable; and here is one that offers the greatest advantages, substituting a certain gain for a threatened loss. It would keep open the already existing lines of traffic, in the continuance of which so many interests are involved; diminish the expense of travelling at least one-half, while the saving in point of time might be carried to an indefinite degree. No estate would be divided, no grounds disfigured, no buildings destroyed, as must so often be the case in the formation of railroads. We should almost entirely escape from the annoyance of dust in summer, mud in winter, and noise at all times. That all these advantages can be attained with perfect safety to the public, there is no reasonable ground for doubt, and we cannot but think that a careful inquiry into the merits of the case would be followed up by exertions to carry this great national improvement into immediate effect.

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* Kettle on the Use of Mechanical Power, &c., p. 24.

PRESENT POSITION OF AGRICULTURE AS A SCIENCE.

By Mr Towers, M. R. Ag. Soc.

The inquiries which we now perceive in every periodical concerning the science of agriculture, are the surest pledges of an advance. While men were indifferent, while they followed contentedly in the old track of routine, there was little hope of improvement. We care not for, or rather welcome, that spirit of pugnacity, which demonstrates that there is an inward sense of something wrong; for while opposers cavil, knowledge advances. Thus, in the querulous paragraph we now copy, we yet find the writer adducing an economical process, by which a quantity of excellent manure may be collected and applied over a large surface with marked effect.

> "Those wealthy scientific gentlemen," says our critic, "experimentalists, who would fain compress the globe into a nutshell, and already talk of carrying manure in their waistcoat pockets sufficient to spread over the ground in their shooting excursions, and who boast of their chemical salts, bone-dust, old rags, desiccated compound, the wonderful nitrate of soda, and the more wonderful guano manure, &c. &c. &c., may despise and laugh at such homely ideas as above stated, but let the industrious farmer pursue the plan, and he will soon find the benefit of perseverance, and join in the merriment, though with a different feeling," &c.

Our friend mistakes the feeling and expressions of men of science. These may indeed pity prejudice, but they do not laugh at any suggestion which can improve practice: they rather say, "here is a new subject of research; we must discover and explain the agents of that increased fertility, of which the practical man is entirely ignorant."

Occasion will present itself to recur to the economical process alluded to, and to another method of preparing a bulk of manure described by a writer in the Gardener's Chronicle, but at present we shall confine our inquiries to the position which agricultural science has already attained.

This will perhaps be most readily understood by comparing the scientific subjects now familiarly spoken of, and which appear in every agricultural periodical, with the utter ignorance of our forefathers. It is quite true that chemistry, before the time of Lavoisier, Priestley, and Cavendish, was anything but a science of pure induction: Agriculture could therefore derive no light from a science which was itself only emerging from the mists of alchemy. Of oxygen, then styled dephlogisticated air—of hydrogen, called inflammable air—of azote and carbon, the philosopher knew really little or nothing. The theory of the four elements, not one of which *is* an element, with the doctrine of phlogiston, constituted the bewildering dogmas of the day. Of what use, *then*, was, or could be, such chemistry to agriculture? The question is still propounded, but by and to whom? Let the agricultural periodicals and provincial newspapers answer the question.

We therein read, that "the chemist can decompose organized matter, and resolve it into its elements;" that if a piece of common wood, bits of carrot, beet, potato, sugar, gum, cotton, flax, hair, silk, &c. be placed in a gun-barrel, or other similar tube of iron, closed at one end, and loosely stopped at the other, to exclude the free ingress of air, and yet permit the escape of the gaseous matters produced by combustion, *charcoal will remain* in the tube; if air be admitted, this charcoal consumes, and nothing but a few ashes remain. The deduction from such experiments is thus expressed: "Wood therefore consists, 1*st*, Of something *volatile*, which flies off of itself, or exhales away by heat; 2*d*, Of *charcoal*, which in close vessels is not volatile, but fixed, yet is combustible in the open air; 3*d*, Of ashes that the fire leaves behind." The same results occur in the combustion of the other vegetable and animal products alluded to, with the difference, that, by the combustion or distillation of wood in close vessels, the figure, and every fibre, longitudinal or horizontal, remains true and unaltered.

We are gratified by observing such statements; we perceive the steady advance of pure science in them, and find assurance that the time is not remote when cause and effect, theory and practice, shall go hand in hand together, and double the produce of the farm.

Science has gained much by simplifying the elements of all the organized beings which constitute animal and vegetable nature; and it is surprising what a revolution has been effected during the course of those experiments which have led to this result. Formerly water was considered a simple element; and so long as this fundamental error remained undiscovered, it falsified every deduction from observed phenomena. Fermentation, the extrication of heat, light, the development of gases, the constitution of atmospheric air, and, above all, the presence and energy of that ethereal essence that, for want of a better name, we call *electricity*—all were misunderstood. The electrization of water, that prime instrument of all meteorological disturbances, remained, in fact, a hidden mystery, till it was given to Dr Faraday to reveal, by a series of experiments, those astonishing phenomena which constitute the subjects of his "*New Researches*."

These experiments were undertaken between the years 1830 and 1838; they are now collected in one volume 8vo, and in the preface the amiable professor expresses his great satisfaction at finding that the different parts, written at intervals during seven years, harmonize so well as they do. "There would," he adds, "have been nothing particular in this, if the parts had related only to matters *well ascertained*, before any of them were written; but as each professes to contain something of original discovery, or of correction of received views, it does surprise even my partiality, that they should have the degree of consistency and apparent general accuracy, which they seem to me to present." (1839.)

It is in vain to be told that "oxygen and hydrogen constitute water; that oxygen and azote (nitrogen) form the air we breathe; and therefore, that water, air, charcoal, and a few ashes, are the primary elements or materials from which have sprung every living thing—every bird, beast, fish, and insect, every tree and green herb, and into which they all return when bereft of life. It is true that the picture is imaginative and striking; but unless we are enabled to form some conception of the vital principle, of the great secondary active agent, the mind becomes a chaos of confusion; it wanders, but finds no repose. When, however, it is demonstrated that every individual grain of water contains in itself, or, in other words, that its elements (oxygen and hydrogen) are associated with so enormous a volume of electricity, "as to sustain a platina wire $\frac{1}{104}$ of an inch in thickness, red hot, in contact with the air, for three minutes and three quarters," and more than equivalent to an ordinary flash of lightning, we begin to discover, to attain at least a glimpse of the agent which effects the disturbances, the attractions and decompositions that are in continuous alternating progress throughout nature. As the elements of water are held together by the electric attraction of its elements, so they are separated and revealed solely by other electrized agents which exert a still stronger affinity upon one or other of them; hence we have new combinations, gaseous, liquid, and solid, attended frequently with the liberation of a current of free electricity, which, like that of the voltaic apparatus, produces certain definite effects.

The great discovery of the electrization of water affords proof demonstrative of the importance of chemistry to *agriculture as a science*; for it becomes a key to all the great natural phenomena. *Meteorology* is a branch of scientific agriculture. The study of the weather generally, the observation of local peculiarities, are points of great interest, which now can be approached with some satisfaction. Heretofore we were left to blind conjecture, and even now we have just attained the dawning; yet as it is evident that every disturbance of the elements of water includes, as a necessary consequence, the voltaic action of definite quantities of ethereal fluid, we possess available machinery, which must prove of incalculable utility in future scientific disclosures.

We therefore no longer regard oxygen, hydrogen, nitrogen, as so many automata, attracting, uniting, and separating, as if by self-volition. We perceive them to be gaseous bodies, the particles of which are retained in the state of aëriform division by definite volumes of electricity, which, under favourable circumstances, induce mutual, though specific attractions, whose minutiæ cannot be traced, but by which all the processes of vegetable and animal organized bodies are performed in due season.

We will now cursorily run over those elementary bodies which constitute the bases of animal and vegetable structure, in order to apply the electrical theory in elucidating various phenomena which are referred to by some modern agricultural chemists, and commence with *carbon*, that only solid substance, which is the chief product of vegetable organization. It will be needless to describe the outward appearance and form of wood-charcoal; they are familiarly known as being the nearest representative of elementary *carbon* which we possess; it may be right to observe that it differs from the latter, inasmuch as it contains about $\frac{1}{50}$ part of its weight of alkalies or earths, which remain in the form of fine ashes after it is burnt in open vessels. During the process of combustion in air or oxygen gas, the pure carbon combines with oxygen, and that curious gas which, when first discovered by Dr Black, was called fixed air, is produced. It is always found in mixture with atmospheric air; and as it possesses an acid quality, neutralizing alkalies, lime, magnesia, &c. it was subsequently called aërial acid. Lavoisier, after discovering its true nature and components, first gave it the name of carbonic acid. Carbon was thus proved to enter into chemical union with the vital principle of the air, and then to assume a gaseous form; and from that period, physiologists have supposed that carbonic acid is the chief source of nutriment to plants, and the base or origin of their woody fibre. Another remarkable quality of charcoal is its power to condense or fix by absorption many gaseous bodies, including (and which is most curious) its own direct product, *carbonic acid*, to the extent of about 35 times its own volume. Of ammoniacal gas, charcoal was found to absorb 90 times its own bulk. These two facts,—to say nothing of other gaseous bodies,—are exceedingly important to agriculture, because they tend to determine the position, as well as the nature, of vegetable nutriment. But we must now inquire how it happens that oxygen can dissolve a substance so fixed, so entirely intractable, as charcoal is under ordinary circumstances. Charcoal cannot be dissolved by fluids, but it conducts electricity, and this power of conduction is indispensable in the process of decomposition. Oxygen must be capable of becoming solidified, otherwise it could not form one of the components of a solid body. When, therefore, oxygen is found in the condition of a gas, it must be united with some elastic fluid, which has the power to keep its particles in a state of complete repulsion. Theory has ascribed the phenomena to the nonentity styled *caloric*. We venture to suggest that they may be more philosophically referred to electricity; for then, in conformity with analogy, we obtain a real agent, fully qualified to act upon and dissolve carbon, whether pure or in the condition in which it exists in the charcoal of wood. We therefore define carbonic acid as an electro-oxide of carbon, possessing acid qualities, which enable it to attract and neutralize alkaline substances. This power of attraction, and all other chemical affinities, must also be referred to opposite electric conditions; and this, in fact, was the view taken by the late Sir H. Davy.

The black colour acquired by soil long under tillage is to be ascribed to the accumulation of carbon; a circumstance which must perplex those who insist upon its rapid decomposition and absorption by the roots of plants. Liebig has laid great stress upon this deposition of carbon, and insists that vegetables derive their carbonic acid, the source of the matter of woody fibre (*lignin*), from the atmosphere. Dumas also says:—"Carbon is procured by vegetables from carbonic acid exclusively, either directly from the air, or that other portion which the decomposition of manures constantly affords, in contact with the roots. But it is especially from the air that plants most frequently derive their carbon. How can it be otherwise, when we observe the enormous quantity of carbon appropriated by ancient trees, and the limited space to which their roots extend themselves? Assuredly, when the acorn sprout, which a hundred years ago produced the oak we now behold with admiration, the soil into which it dropped did not contain one thousandth part of the firewood which the tree now affords. It is the carbonic acid of the air which has supplied the remainder,—that is, almost the whole. But what can be more conclusive, in addition, than the experiment of M. Boussingalt, in which peas planted in sand, moistened with distilled water, and fed upon air alone, found in that air all the carbon requisite for them to grow, to flower, and bear seeds?" (*Statique Chimique.*)

The experiment just adduced must be extremely interesting to any one who receives it with implicit faith; and it can be repeated with great facility by employing the purest silver sand. If it were allowed us to appeal to a horticultural fact in support of an agricultural question, we might observe that, in October 1841, a small sprig of the double oleander (*Nerium fragrans*) with one leaf-bud at its heel, was cut from the plant, and inserted in a phial of water. It lived all winter in a cold vinery, and being removed to a stove at 60°, early in the last spring, developed a large system of white roots from the base of the bud at the heel; which bud then sprouted, forming a shoot that quickly overtopped the cutting. Gradually, however, a ring of granular matter formed round the base, between the bark and sapwood; a second system of fibres was produced, and then the old shoot elongated. Now (June 26), both shoots are healthy and verdant, with fresh leaves; the roots are prodigiously numerous, and nothing but water has been given to them. True it is, that particles of carbon may float in the air and be taken up by the water; and, indeed, all our experiments are liable to certain contingencies which involve some doubt; but there are many facts that forcibly tend to prove the inevitable necessity of the removal of accumulating carbonic acid from the atmosphere, and point to vegetables as the instruments.

Yet, we cannot accede entirely to the theory of Liebig, that plants, whether as seedlings, herbs, annual, or perennial shrubs or trees, after they have developed their foliage, absorb *all* their carbonic acid from the atmosphere; neither is it at all apparent that they are necessarily dependent upon that acid for the matter which forms their woody fibre. In the first place, it is quite certain that the elements of water are present in every portion of the vegetable structure; and secondly, though water and earth may support a plant in life, yet if that earth be deficient in some substance which acts as a manure, that is, of a combination of hydrogen, oxygen, and carbon, in the condition of decaying vegetable matter, suitable to the nature of its roots, it will never continue thriving and verdant. It is in this adaptation of manure to plants and variations of soil, that the science of agriculture will be most important; at present it remains a gordian knot that no one has been able to unravel.

The direct operation of a manure is not understood, nor is it known in what consists the enriching of a soil. Peat-mosses are rich, if we admit that a predominance of carbonaceous matter constitutes richness, or, according to Davy, that a soil covered with peat is a soil covered not only with fuel but also with manure; yet peat is generally barren.

It should appear that the direct operation of the roots of a plant is to decompose, on the principles of voltaic electricity, a certain quantity of water in the soil, thus liberating a stream of electricity which then decomposes the manure, setting free its elements of water, that in their turn combine with definite quantities of carbon at the moment of its extrication. Each plant, therefore, is enabled to laborate food suitable to its nature, and thus carbon is taken up, not merely as carbonic acid, but as some compound of hydrogen with oxygen, not perhaps appreciable by analytic chemistry. The greater part, however, of the carbon is deposited in the soil, to which it confers depth of colour. The carbon thus set free, attracts and absorbs some of the carbonic acid of the air, thus retaining a store of it in the vicinity of the roots; and being soluble in rain-water, it is gradually taken up by the plant. The carbon itself in the mean time increases, with every portion of manure or vegetable fibre that is subsequently decomposed; and thus, as in peat-mosses, a soil may become surcharged, or glutted with carbonaceous matter.

Peats are meliorated by draining, by the addition of loams and other substances containing alkalies; and here we acquire the knowledge of another important chemical fact; and when with this we ascertain by direct experiment the nature of the inorganic substances, such as chalk, magnesia, fixed alkali, or metal, which are contained in the ashes of a plant, a great step has been taken in the science of agriculture.

Heretofore husbandry has been conducted in a dark, bewildered system of routine, in which causes have been entirely overlooked. But, by the very nature of the enquiries that have been, and are daily urged, we may assure ourselves that a new system has been introduced and is rapidly gaining ground. As a further proof of this, it is only needful to remind the reader of the numerous theories which have been broached respecting humine, humic, or ulmic acid and humus, one substance with many names, equally unappropriate and unintelligible. The following passage, extracted from a provincial newspaper, places humus in its proper position, and presents a fair and candid view of that which learned physiologists have in vain attempted to explain:—

> "A great deal has been written in books of agriculture and chemistry, upon humus, humic acid, ulmine, and ulmic acid, the geic acid, the humates, ulmates, geates, and other *inventions* rather than discoveries, of ingenious men, who gave each other the change in words instead of facts. All that the agriculturist requires to be told is, that these are merely new names for carbonaceous matter in certain states of combination and decomposition, which, for every practical, aye, and every scientific purpose, can be studied to more advantage, by confining the attention to the most striking among the chemical properties of carbon and charcoal. In fact, to pursue successfully the proteus carbon through all its changes of form, would be to fathom the profoundest depths of animal and vegetable physiology, and to establish at once the true theory,—which must reveal the true practice—of agriculture."

We have, on many occasions, exposed the charlatanry of the humic theory. It is all very well to test and explain a substance which is found to yield a brown solution to alkalies and alkaline earths; but to mystify, by far-fetched terms, a product of decaying vegetable matter, which every one who has seen an old dunghill, has been familiar with time out of mind, is unworthy of the man of science. The great fact that can be arrived at from the study of humus, is the assurance that ere dung can be converted to vegetable aliment, it must be reduced to nearly the last stage of carbonization, that, wherein the remaining elements of water when separated by the agency of the vital principle of a plant, shall leave the residue of the manure reduced to the condition of effete black carbon. We are told that fresh dung burns vegetation, and the enquiry into humus interprets the phenomenon. Recent dung, according to the proportion of urine which it contains, develops more or less gaseous ammonia, and this alkali, when extricated in contact with vegetable bodies, effects chemical attractions which are frequently fatal to them; thus, it happened in an experiment to destroy the scaly coccus that infested the leaves and joints of a gardenia, a very small quantity of ammoniacal solution was placed near the pot in which the plant grew, and a bell glass was inverted over it. In a minute or two the foliage assumed so intense a verdure that, for the time, it was striking and beautiful; but this tint declined rapidly, and the plant perished in a few days.

Ammonia, to the extent in which it exists in rain-water, is vital to plants. In that of a sulphate or muriate, as we find it in coal-soot, it is peculiarly excellent, provided the soot be restricted to about 20 or 25 bushels per acre; but if its ammonia, or indeed any ammonia, be exhibited in the condition of a caustic vapour, vegetation is periled in proportion. Hence it is inferred, that the fermentation of the dunghill is of extreme utility to the farm; and as to the loss incurred by the escape of the gases, it is just nothing; for those products, which would be fatal to the crops, are conveyed into the volume of the atmosphere, therein to be laborated by the etherial electrising principles, and returned to earth in a condition which implies perfect safety, whether they be absorbed by the foliage or by the roots.

Hydrogen, the lightest of all known things that have weight, combines with oxygen, in the proportion of two volumes to one; but its atomic weight is estimated as 1 to 8; hence, when it exists in the state of a vapour or gas, its atoms must be most minutely divided, and kept asunder by a repulsive medium of vast energy. This medium we conceive to be electricity, and therefore regard hydrogen gas as the most highly electrized element in nature. Its electricity being alkali (reasoning by chemical analogy) to that of oxygen, the two gases are disposed to unite in definite proportions, and produce fluid water, the electricities neutralizing each other, and remaining quiescent or masked, till disturbed by some more powerful attractions. It is this quiescent fluid which was revealed by the experiments of Dr Faraday, and which, if we mistake not, is destined to bring to light all the phenomena of meteorology.

Azote (i. e. *Nitrogen*) is a gas little understood: in volume it forms 4-5ths of respirable atmospheric air. It is assuredly a vehicle of electricity; but what rôle it plays in nature—whether it be a simple element or a chemical compound—we know not. An experiment, which more than once produced the results now to be described, led us to entertain a doubt of its constitution as an element. Oxygen and hydrogen gases, in the proportion to form water, were introduced into a sound bladder, to which a stop-cock, air-tight, was adapted. The mixture was carefully tested, and proved by soap-bubbles to be highly explosive, either by application of fire or by passing the electric spark. This bladder was conveyed to some distance, and an hour or more elapsed before it was used; then, on attempting to explode inflated soap-bubbles, it was found to be perfectly inert: neither flash nor report could be produced. Others, we believe, have made similar observations. If then there were no mistake or delusion, the gases must have combined to generate an unexplosive mixture, not varying in bulk, or varying very little from that of the gases first combined. Whether the gas so produced were nitrogen or otherwise, we venture to suggest that there is no such thing as a simple element, inasmuch as every substance in nature is combined with a definite quantity of electricity, which retains it in its integrity for a time, till that electricity be attracted by some disturbing power, which disposes it to enter into a new combination.

Of the importance of azote to agricultural chemistry, we appeal first to Sir H. Davy, and then to a paper from an unknown pen now before us. As to Liebig, were we to cite his testimony, ten pages would not suffice to collect his multiplied facts.

> "After oxygen, few substances are of more importance in the economy of nature than nitrogen (azote.) Forming so great a part of our atmosphere, it is scarcely possible to conceive that it must not be subservient to other important purposes, besides that of merely diluting oxygen gas. It is dissolved in the water of the sea, of lakes, springs, and rivers. It enters largely into the composition of some vegetables, and of all animals; and it is extremely probable that great phenomena, now obscured, such as the renovation of the air, rain, and respiration, would be solved by an accurate knowledge of this gas."

Our philosopher had long suspected the compound nature of azote; but his experiments were non-effective. "Azotized matter," observes a French writer, "is the true origin of every part of a plant."

> "Two compounds—*nitric acid, ammonia,* the one a corrosive acid, the other a strong and pungent volatile alkali—are the results of the combination of azote with one or other element of water. Now, since azote constitutes four-fifths of the atmosphere, and water abounds everywhere, ready to supply oxygen to form the nitric acid, or hydrogen for the ammonia, one might have expected that science or chance would have taught mankind how to combine these cheap and abundant elements together at will, so as to procure ammonia for the use of medicine or the arts, or at least nitric acid for saltpetre. Such, however, is not the case. One of the greatest philosophers this or any other country ever produced (Cavendish), was occupied many days with an electrical machine, in converting the air contained in a small tube into nitric acid. It is still more difficult to form ammonia from a direct union of its elements; nothing less than thunder and lightning seem competent to the task."

So remarks our unknown agricultural chemist, and we again take occasion to compliment the farmer on the position which his art is assuming in connection with chemical science: it displays a prospect of great promise. We must, in conclusion, observe, that, although ammonia cannot as yet be formed by a direct composition of its elements, it may be decomposed and resolved into hydrogen and nitrogen gases—3 volumes of the former to 1 of the latter; and this mixture can be analyzed by deflagration with oxygen, and the exact nature of its components proved to demonstration.

If, indeed, man can neither determine the character of azote, nor combine it with hydrogen, electro-chemically, so as to form ammonia, it only proves that his instruments and chemical agents are defective. Natural electricity is, as we perceive, stated to effect this combination. We therefore venture to suggest that, in the atmosphere, electro-magnetism is the agent, and that watery vapour floating therein is decomposed simultaneously with the formation of ammoniacal gases. Chemistry itself is in its infancy; its application to agriculture just becomes perceptible. With the exercise of patience, and a steady pursuit of scientific investigation, no rational doubt can be entertained of improvements which will meet every exigency, and greatly increase the prosperity of the land.

ENGLISH AGRICULTURE.

By Mr Main, Chelsea.

In giving a sketch of the agriculture of England, I can only notice the general principles, and a few of the more prominent systems in actual operation. On such an extent of country many different kinds of soil occur, and we invariably find that, whatever the nature of the soil may be, whether clay or sand, or any intermediate quality, that character fixes the mode or system of farming which is followed thereon.

The soils which are most commonly met with and forming the agricultural face of the kingdom, are alluvial, diluvial, or other formation, all deposited from or by the action of water. The alluvial occurs in valleys through which rivers flow; and the diluvial forms the level and slopes of the more elevated ground.

The alluvial soils are the richest portions of the country, and whether as meadow, pasture, or arable, yield the largest profits to the cultivator if dry, for some such soils are subject to occasional floods. Still this kind of land is the highest rented, pays the highest tithe (except hop and other gardens), poor, and all other county and parochial rates.

The diluvial deposites occupy by far the greatest portion of the cultivated surface, and are very variable in character. In some places, an obdurate unmanageable clay, in others, a light sandy gravel, and these often occurring on the same farm.

English farms vary in size from fifty to five hundred, or even to one thousand acres. They are mostly divided into separate fields by thorn-hedge and ditch-fences, the fields being larger or smaller according to the size of the farm. Some farmers keep the hedges low, and the ditches well scoured out especially where they act as drains; others scour the ditches and remake, that is, plash down the hedge every seventh or eight year. There are usually hedge-row timber trees or pollards in the hedges, and which, though not necessary for the healthy growth of corn, give a dressy appearance to the country; and as shelter are certainly beneficial to live stock. In some parts, wood is the only fuel made use of, and there the topping of pollard trees, and fagots from the newly made hedges, are indispensible to the tenant. But the use of coal even for culinary purposes in farm-houses is rapidly gaining ground.

The occupiers of the smallest farms are only a superior class of labourers; and those of the large holdings are an opulent and highly respectable body of men. Among these the great graziers are pre-eminent, being located on rich tracts of land the most suitable for breeding and fattening all kinds of cattle, and manufacturing vast quantities of butter, cheese, bacon, and pork. Such farms require a great capital to stock them at first; and great vigilance and judgment to keep up a full and profitable store of both flocks and herds.

A few farms are entirely arable, except perhaps an orchard at the back of the homestead. But the greater number are of a mixed character, partly grass and partly arable, the most desirable proportions being one-third grass and the other two-thirds arable. Such farms are mostly on the diluvial deposite, and as already mentioned consist of various descriptions of soil, and of course require every expedient of agriculture to be practised upon them. I shall endeavour to give a detail of the business of a farm of this mixed character, and which will include most of the processes carried on by a great majority of English farmers.

The rents vary from twelve shillings and sixpence to forty shillings per acre; the medium from twenty-five to thirty shillings. To the rent must be added about a fourth for tithes, whether taken in kind, or paid by a composition in money; and a similiar addition to the rent may be calculated on to pay poor and church and county rates.

Some landlords grant no leases; but in case of any expensive permanent improvement being executed by the tenant, the landlord generally pays one-half the expense, or finds materials, the tenant doing the labour. When leases are granted, they are what are called *running* leases of five, ten, or fifteen years, or what is more common, seven, fourteen, or twenty-one years, terminable at the end of any of those periods at the option of the tenant. Sometimes the landlord reserves to himself a similar option, or if not, by certain restrictive clauses in the lease protective of his own interests, the infringement of which annuls all the conditions. The great fluctuations to which the business of farming has been subject of late years has rendered the desire for leases less strenuous than formerly; and there seems to be a mutual feeling between the contracting parties to substitute equitable agreements instead of expensive leases.

In whichever way a farmer holds his farm, whether by lease or by agreement, one of the most common conditions is, that *he shall farm or cultivate the land according to the custom of the country*; that he shall sell no straw nor hay off the farm without bringing on an equivalent in dung; that he shall make no waste; plough up no meadow without being liable to pay a penalty of ten or twenty pounds per acre; and that he shall leave the farm in as good condition as it was when he entered upon it.

About fifty years ago, and after the custom of sowing turnips on the fallows, and grass seeds with barley or oats, was introduced, the general custom of the country was the *five shift* course, namely, a fallow dunged for turnips to be fed off by sheep; next, barley with clover and rye-grass, or clover alone. Next year the clover is mowed once or twice, or mowed once in summer, and afterwards depastured with store-sheep until about the first of October, when it is ploughed up and sown with wheat, which is the crop of the fourth year; a part of the wheat-stubble is as early as possible dunged and sown with winter tares to be cut green for the stable in May and June, and the rest of the wheat stubble is sowed with oats in the following spring, and is the crop of the fifth and last year of the course.

This was the custom of the country at the time above stated, and was invariably adhered to, any deviation being considered ruinous. But it was a system in some measure imposed on the farmers not only by the mandates of their landlords, but from their inability to keep a sufficiently numerous herd of live stock, owing to their want of pasturage and other green or dry forage. Thus limited in live stock, they could not muster up in their yards, folds, and hovels, more dress or manure than was barely sufficient for *one-fifth* of their land annually. Notwithstanding the staid and grave character of the old farmers, they were not insensible to the loss they sustained by being obliged to sow two white crops consecutively, and those of them who could afford to do so, lamented that they could not depart from the old system, and banish oats entirely from the course; and by having turnips and other green crops every fourth year, enable them to keep more stock, and consequently get their land into better heart by dressing it every fourth, instead of every fifth year.

This improvement in the system of farming was soon proved to be absolutely necessary; and at the instance of several of the most influential landlords, many of the old trammels have been struck off, and the four-shift course has been adopted by every one who had the will and the means of doing so.

As already noticed, these farms are of various size; but whether large or small require a capital of not less than *fifteen pounds* per acre to stock them. The establishment of a farm of *one hundred acres* requires a team of four horses, a ploughman and pough-boy, a cow-man or shepherd, and a tasker or barn-man. The hedging, turnip-hoeing, mowing hay, mowing and reaping corn, thatching ricks, and binding hay, is usually done by free labourers in the neighbourhood. This is the usual establishment on a farm of one-hundred acres; but it is found that the larger the farm, the more economically is it managed. For instance a farm of four-hundred acres may be carried on with three teams; and on all farms the teams are reduced from four to three horses each, whether at plough or at cart, or waggon on the road. Ploughing with a pair of horses abreast is only introduced on light loamy or sandy soils, where only a light kind of plough can be employed. But on clayey gravels, and all heavy soils, the old Hertfordshire wheel-plough with an iron skeleton share, weighing half a hundred weight, is still used. One acre per day is the usual task of a plough team, whether done at one or two yokings. Ploughing with oxen, or with oxen and one horse as a leader is still the custom on the hilly parts of the west of England, and has been tried by many amateur farmers in other parts; but it is a decreasing rather than an increasing custom. On stony or flinty soils, oxen are unprofitable beasts of draught.

There are a few general principles by which all farmers are guided, wherever they may be placed, or whatever the kind of soil they may occupy. *First*, The land must be dry naturally, or rendered so by artificial drainage. *Second*, That aration, whenever performed, should be complete as to depth, perfect disintegration by the plough, harrows, and roller, and all this done only when the soil is sufficiently dry. *Thirdly*, That no root-weeds be allowed to usurp and exhaust the land. *Fourthly*, That the various crops should succeed each other in the most judicious rotation; and, *fifthly*, That the soil be liberally supplied with the most suitable kinds of mannure to keep it constantly in heart.

I shall now detail the proceedings of an English farmer as a tenant of a farm of a mixed character, and following the five-shift rotation. He commences fallowing his oat-stubble as soon in the autumn as he can; ploughing deeply, and striking up the water-furrows in order that the ground may lie as dry as possible throughout the winter. In the spring the first opportunity is taken to fill in the furrows by going *about* in each. The field is then ploughed athwart; and harrowed, especially if the original autumn furrows be still left in entire pieces, by the cross ploughing, and bound together by couch or other weeds. If many of these be harrowed out on the surface they are collected by women rakers, burnt or carried off. Some farmers never trouble themselves to burn or carry off weeds; but trust entirely to the plough and the sun to kill them; and this, I have seen completely accomplished in dry seasons on light soils. Another ploughing athwart is given before the end of May, which brings the surface to the same state it lay before the first cross ploughing was given. The ground by this time being perfectly loose and friable, the harrows are again put on, and which generally bring any root-weeds to the surface to be got rid of.

The next operation is drawing out the field into lands or ridges, and which are usually of eight steps, unless the soil is liable to hold moisture, when the ridges are only four steps or less if very wet in winter. Ploughmen pride themselves much in drawing out a field accurately; and there are sometimes very amusing contests among the neighbouring ploughmen who shall most excel in this manœuvre; because on the regular breadths of the lands subsequent operations are more regularly performed.

The dung is next carted on, and laid in heaps along the middle of each land. Four horses, two in shafts and two in traces, are employed: the latter are shifted from the empty to the full cart alternately. The carts are large, the wheels having six or nine inch tires. From seven to twelve loads are laid on each acre, immediately spread and ploughed under the seed furrow.

The turnip seed (three lbs. to the acre) is sown broadcast and harrowed in; and if cloddy, rolled. The plants appear on or about the fourth day after sowing, and if the weather be favourable, and the fly keep off, they soon get into rough leaf; when they are considered safe. But if the fly alight upon the plants while in the seed-leaf they are soon destroyed, and then the field must be reploughed and sown again. This loss and extra labour often happens more than once, sometimes thrice, before a sufficient plant can be depended upon.

Soon as the turnip plants are sufficiently grown, the hand-hoes are set on, and paid by the acre, at the rate of six shillings for first going over, and two shillings per acre for the second setting out; and which finishes the culture of the crop. The varieties usually sown are Swedes, Norfolk-whites, and sometimes an acre or two of tankards. The last are eaten off first, as they are impatient of frost; and the first are reserved till late in the spring. An acre of good turnips maintains five score of sheep for one week, and on this as a rule, the flock are put on turnips sooner or later according to their number compared with that of the acres of turnips, so that they may last as long as they are wanted for the flock.

Folding with common hurdles is generally begun at the highest side of the field, not only that the sheep may have, when not feeding, the dryest lair, but also because the top of the field being generally of inferior quality to the soil at the bottom, is more benefited by the more frequent reposing of the sheep upon it. There should be a sufficient number of hurdles not only for penning the flock on the spot to be eaten, but enough to be set round against the hedges to keep off the sheep from leaving their droppings in the ditch, or on the bank.

The flocks usually consist of couples, that is, ewes and lambs, and four or six toothed wethers. The former have a fresh pen every day; and the wethers follow after to eat the principal part of the bulbs, which are picked out of the ground, and chopped in pieces for them. The whole have occasionally both hay and trough-meat either in the field or in the sheep-house, on wet or stormy nights. The entire flock, ewes, lambs, and wethers, are all intended for the butcher, and even if possible sold before the turnips are ended. There is a great demand for fat lamb about the festival of Easter; and every means are employed to pamper and push them forward for that season. The ewes and wethers are gradually draughted off to market, either before or after they are shorn; and if there be any "odds and ends" left, they are added to the store flock.

In the autumn, and as soon as the farmer can judge of the amount of his green and dry food for sheep, he buys in his forward ewes and wethers for fattening. The ewes are commonly those of the Dorset or Wiltshire breeds, which begin lambing about the end of November; and the wethers are mostly South-Downs, if the land be of middling quality; or Lincolns or new Leicesters, if the pasturage be plentiful and rich.

Sheep have a good deal of attention bestowed upon them at all seasons. The shepherd is generally a steady and trusty servant, and well acquainted with his business and charge. He acts as physician, surgeon, and butcher to the flock ; shears and winds the wool, all which he attends to with the assistance of a boy and a dog. Sheep-shearing generally takes place about the beginning of June. In most parishes there is a gang of men called shearers, who on appointed days go from farm to farm, washing and shearing the flocks. They are paid at the rate of about three shillings and sixpence per score, with victuals and drink, ending with an abundant supper, of which the other men on the farm, together with their wives and families, are invited to partake. It is a rural festival, and looked forward to and partaken of with high glee.

On some large farms the business of suckling house-lambs is a laborious and important part of the shepherd's duty. For this purpose a large commodious lamb-house is erected, and near it an enclosed yard surrounded by low sheds containing racks for hay and green meat, and troughs for brewer's grains for the ewes when their pastures are short. The floor of the lamb-house is divided into several compartments for the convenience of keeping the different classes of lambs apart, and also for keeping the unsucked ewes from among those which have been already sucked. The most forward part of the ewes begin dropping their lambs at Michaelmas, and are kept in a pasture during the day, until half a score or a score are dropped, when they are housed on nights ; and from which the lambs are never allowed to come out till they are fit for market. At six o'clock in the morning of the day after the lambs are confined, their mothers are let out into the pastures ; and at eight o'clock, if there be any ewes which have lost their lambs, these are brought into the lamb-house, and held by the head till the lambs by turns suck them dry. At twelve the mothers are brought in to their own lambs, and remain with them for an hour, when they are again let out to graze in the pasture. At four afternoon the ewes having no lambs are again brought in to be held and sucked dry, and at eight the mothers are let in and pass the night with their lambs.

This mode of suckling is continued from year to year, the fat-lambs being sent off soon as ready, say in about two months, and other ewes and lambs taken in, so that the lambs are always proportioned to the quantity of milk. The price of house-lamb varies from two to four guineas each, and in the early spring, with good luck, it is a very profitable business. Much depends on the conveniences of buildings, pastures, &c., and on the skill and assiduity of the shepherd in fattening house-lamb, in keeping the lambs healthy, and the ewes unexhausted by their wasting exercise.

While the lambs are confined, they are allowed chalk to lick, both solid and in powder, in order to prevent looseness and fever; and their house must be always well littered with wheat-straw. They are fond of having little bundles of the same to nibble, some little of which they eat; this, however, is more to amuse them than for any thing else. House-lambs are neither castrated nor docked.

The business of fattening house-lambs can only be profitably carried on within a moderate distance of London, or of fashionable watering-places. Cheltenham is famous for house-lamb, and the London market is mostly supplied from Middlessex and the adjoining counties of Essex, Hertford, Buckingham, and Berks.

Proceeding with the routine of the five-shift course, and keeping to the same field, the turnip-ground is begun to be prepared for barley and seeds as soon as a sufficient portion is cleared. This is executed as follows:—The furrows (into which an undue portion of the tail-dress has collected during the folding) are first opened out to scatter the droppings more equally, and that they should not be too deeply covered by the plough. The ploughing is then begun, but with a very shallow furrow. Four inches is considered quite deep enough, and for this reason, the tail-dress is all on the surface; and were this buried too deep, neither the barley nor seeds would receive that excitement in the first stage of their life which this dress is so well calculated to give, and, therefore, shallow ploughing is preferred. If the soil by this first ploughing turns up sufficiently dry and pulverized, the barley, two and a half or three bushels to the acre, is sown broadcast, one cast before the first tine of the harrows, and one cast after or behind the harrows. A *tine* of the harrows, is going once in a place, a *bout* is twice in a place, reversing the movement. If the soil turns up cloddy, and cannot be reduced by harrows and roller to a perfectly fine state, it is ploughed again and again till the necessary fineness is obtained, for neither barley nor seeds prosper unless both rise simultaneously.

The barley being sown and rolled down, the grass-seeds are sown also broadcast as equally as possible, This is done either by what is called *pinching*, or by *griping*. The first is by taking up as much seed as can be held between the thumb and two fore-fingers of the right hand united, and jerking it forcibly *here and there* at every fall of the left foot, and not thrown downwards, but obliquely up in the air, that it may be better scattered. By griping, the hand is filled with all the fingers close, the thumb used as a lid is raised at every fall of the left foot, and *here and there* as before. Each land or half-land is sown twice over, once down and once up; and if two sowers be employed, they shift places at every turn. The seeds are next tined-in, and the whole is again rolled smooth.

The proportions of seeds for an acre, are 6 lbs. broad clover, 2 lbs. Dutch clover, 2 lbs. yellow clover, and 3 half-pecks of rye-grass, all intimately mixed together. Sometimes 10 lbs. of broad clover only are sown to the acre, and the next time the same field is similarly cultivated, the broad clover is entirely omitted, the yellow and Dutch in greater quantities being substituted. Sometimes the common rye-grass is only sown when it is intended to be thrashed for seed, or made into hay, it being for either rack or manger meat the heartiest of all other hay, if well and quickly got up, and not put into large ricks, for it heats violently.

Broad clover hay well got up is highly valued, either for the rack, or cut into chaff for the manger. Brewers use it chiefly for their highly pampered horses, but prefer that which has been sown very thickly, because it being of weaker growth, is easier drawn through the rounds of the rack by the horses, than that which is grown thinly; the stems in the latter case being so very substantial and rigid, though when cut into chaff, is little inferior to corn for working-horse keep.

During the growth of the barley, it requires but little attention, no weeding being requisite; when fully ripe, which happens between nine to twelve weeks from the time of sowing, and when the ears are bent down, it is ready for the scythe, though no corn can stand longer without damage than barley. The earliest sown always turns out the heaviest in hand, consequently, fetches the highest price if not discoloured.

Barley is generally ripe in the month of August. It is mown with scythe and bow (a slender tough rod having one end fixed to the heel of the scythe, and the other end brought up in a bow and tied to the middle) across the lands if the wind permits, or as nearly so as possible. Laying the swathes across, renders raking-in easy and regular, two lands being raked towards the central furrow, which is left clear and open for the carriage and horses to pass along in loading. As the barley-land is perfectly smooth, the scythe clears off every particle of the straw, as well as the clover which has sprung up along with it. This sometimes forms a considerable portion of the swathe, and if showery weather sets in, retards the drying of the barley, and often renders the grain dark in colour, which is a certain loss, for it cannot be too bright in colour for malting. To gain this property it should be bleached in the field after it is cut, by turning it to the light of the sun, two or three times before it is ricked, or carried to the barn.

Carrying barley in good condition is a desirable affair, and many farmers run the swathes into wads to be immediately taken up, leaving the rakings to be got together afterwards by the horse or heel rake. Barley straw, especially when mixed with clover, is excellent fodder for store beasts in the yards in winter.

Almost every farm has a barley-barn, into which no other kind of corn is ever admitted, for no kind of grain is so seriously deteriorated by admixture with other kinds as is that of barley intended for the maltster; a single oat in a sack will frighten away the most eager purchaser. Cockles, so often seen in barley, are not half so much dreaded in the sample as any kind of corn; besides, the seeds of this weed are easily riddled out by a properly constructed brass wire sieve. Barley is thrashed either by the machine or flail, and is cleaned up for market with very great care. A good sample should be bright in colour, round in shape, with a wrinkled skin, and in weight, per bushel, nearly approaching that of wheat. From four to five quarters to the acre is called a good crop. Mowing costs about three shillings and sixpence per acre, more or less, according to the thickness or quantity of clover on the crop. The barley-stubble is lightly depastured with sheep during the autumn and winter, but withdrawn early in spring.

Some farmers who wish for a heavy growth of clover, and a moderate growth of the succeeding crop of wheat, give their young clover a dressing of dung, if to spare, if not, a dressing of coal-ashes, carted on and spread during the frost of winter. This certainly brings a heavy swathe, both at the first and second cuttings of clover, and being partly exhausted is not so apt to cause a too rank crop of wheat, which circumstance requires to be guarded against on land in high condition.

The young clover is cleared of stones or other matters in the spring, rolled down, and shut up for good about the 20th March. It is usually ready for the scythe about the 20th June, sooner or later according to the warmth of the season. The rule is to cut when the clover is in fullest bloom, and if rye-grass be among it, when this last is in flower. Clover-hay is soon made if the weather be favourable; shaking up the butts of the swathes in the second day, and turning them on the third, in such way as that the whole leaves and stalks are partly withered, it will be fit to carry on the fifth day, if the swathes have been carefully opened to admit sun and wind. When properly made, it should remain of a pale green colour, and secured in small rather than in large ricks, lest it should heat too much, and so injure both colour and quality. But a moderate degree of heating in the rick is absolutely necessary, for unless this takes place, the hay is little better than straw. This circumstance is not attended to so much as it should be. Timid or indolent farmers often allow their clover as well as meadow-hay to lie too long in the field, both in swathes or in cocks, before it is ricked, and though hay may be carried too soon from not being withered enough, or carried too soon after rain, yet in either case, there is more hay spoiled by being taken up too late than too soon. A fermentation from the saccharine quality of the hay, renders it particularly palatable, as well as nourishing to cattle, and is a very different thing from a heating occasioned by too much moisture.

When the first crop is carried, and which usually amounts to a ton or a ton and a-half to the acre, it is determined whether the field shall be shut up for a second crop, or whether it shall be depastured. Some people, and especially amateur farmers and landlords, imagine it a downright robbery of the riches of the land to remove two crops of clover in the same summer. But this, like all other theoretical ideas, is a silly mistake. All land in this country is much impoverished by exposure to the summer sun; but if constantly shaded, even by the heaviest green crop, it is but little deteriorated, as the succeeding crop of wheat fully and visibly proves. It is thought that, if the second crop be depastured, although by browsing off the herbage the surface becomes exposed, yet, the tail-dress left by the sheep makes up for the humid riches exhaled by the sun. But this is never seen unless it happens to be a dripping summer, when very little difference can be observed in the wheat, whether grown on the once or twice mown lea. The second crop turns out about one ton to the acre, is inferior to the first crop in quality, and is generally cut into chaff for the stable.

If the second crop is off in good time, the lea is hard stocked to eat up every green leaf before the ploughs are introduced. The ploughing is done with much care to lay the ridges in the best form for throwing off surface-water. Between the end of September and the 12th of October is said to be the best season for sowing wheat. The seed is prepared for sowing by being steeped in brine from eight o'clock in the evening till five o'clock next morning. While in the steep it is frequently stirred, and every thing that floats is carefully skimmed off. The brine is made strong enough to float an egg. At every farm-house there are a couple of tubs kept for this purpose; a large one to hold a sack of wheat, and as much brine as will serve to cover it. This large tub has a tap at bottom at which the brine is let off—the wheat being kept back by a tap-wisp. When the wheat is sufficiently drained, it is turned out on a paved floor; and quicklime is sifted over it and turned backwards and forwards until every grain is coated with lime; it is then formed into a heap and covered with sacks till it is wanted on the field. There are many different ways of preparing seed-wheat, all of which are practised for the purpose of freeing the seed from the sporules of the fungi, called smut, and mildew, rust, or blight. The spori or seeds of those diseases are supposed to be killed by the brine and caustic quality of the quicklime. It cannot be doubted that such preparation is partly, though not entirely, effectual; and certainly a dressing of lime to wheat-land is a preventive of smut.

If the summer has been showery, slugs most likely will be prevalent, and to prevent their motions in the soil, a pressure follows the plough and closes the creases between the furrows, and presses closely down the furrows themselves before the seed (two and a-half bushels to the acre) is sown; and then harrowing twice or thrice in a place finishes the work. If no pressure be used, and especially if the ground works light and dry, the land is, in such circumstances, well trodden down with a flock of sheep driven repeatedly over till the surface remains smooth and firm; and this not only to obstruct the motions of the slugs, but to prevent an uncommon birth of seed-weeds, charlock and poppy, in the spring.

The field, if inclined to wetness, has every furrow struck up, and every water-furrow scoured out, and the whole smoothed and levelled with the spade. Thus, the wheat-field is left to nature until the spring, when sometimes the harrows are usefully employed to roughen a compacted surface, and afterwards rolled to produce a concussion of the bed in which the *coronal* roots are spreading themselves. And if any top-dressing has been provided it is now thrown over, especially on such spots where the wheat is thin or weakest.

Soon after this the weeders with their paddles go over the field, cutting or pulling up every dock, thistle, or other noxious weed they can eradicate by such means; and which weeding is, if necessary, continued till the wheat is two feet high.

Wheat-harvest usually begins in the last week of July, and is often finished in a fortnight. It is mostly reaped by some few of the constant men, aided by a few others called *month's* *men*: these are extra hands taken on to assist getting in the harvest, whether it continues three or six weeks. A fixed price for the harvest is previously agreed upon, varying from three pounds ten shillings, to five pounds, besides beer, four or five pints (English) of which are allowed per day, but no food. Some farmers allow food also; in which case the harvest wages are much less. Sometimes reaping is wholly done by extra hands, who are paid by the acre, charging from ten to twenty shillings, but without either beer or food. I have had a fair standing crop reaped for eight shillings per acre; and after a wet and windy time have paid twenty-four shillings for a like bulk of crop; the reapers earning less money at the latter, than at the former rate.

The wheat is bound either by single or double bands, that is, by one length of the straw instead of two lengths united below the ears. The first are necessarily small sheaves, which are soon ready for housing; the second are often too large, and require more field-room; though the latter is mostly practised. Scotch *shearers* penetrate as far as Lincolnshire occasionally; and from thence work their way homewards. Irish reapers are plentiful in the west and southern counties, and are mostly employed by the largest farmers.

Wheat is generally housed; but it is no misfortune if a rick or two be required to be set in the rick-yard. They are mostly set on stone, or metal staddles, with either octagonal or square frames.

The yield of wheat in this country varies from sixteen to forty bushels to the acre, with from one and a-half to two loads of trussed straw. The grain is generally thrashed with the flail; and to thresh and clean a sack, and bind the straw in trusses of 40 lb. each with two bands, is the daily task of one man; which, besides laying a fresh flooring for the next morning, he finishes about three o'clock afternoon, after which hour he is not called on to do any work, except in hay-time and harvest.

About an acre, more or less, of the wheat-stubble is, as soon after the wheat is carried as possible, dunged, ploughed, and sown with winter-tares; and the rest of the stubble is fallowed up preparatory to being sown with oats in the spring.

As soon in that season as the ground is sufficiently dry the field is again ploughed, sown, and harrowed. The quantity of seed—from four to six bushels per acre; the kinds, either common white, black Poland, black or white Tartarian, or small black. In March or April the oat-field is rolled, in which state it remains till harvest.

Oats are mown with scythe and cradle, or with a bow only. The crops are seldom heavy, unless on very rich ground, or when the ground has been liberally dressed for the crop, in which case it must be reaped and bound in sheaves. But ordinary crops are sometimes so short and light that a good cradle-mower will cut down four or more acres per day, for which he is paid at least half a crown per acre. After lying in swathe for a few days, they are raked in, carted to the barn, or rick like barley; and, when flail-thrashed, the tasker must clean two sacks per day, tie up the straw in bundles, and remove it to the cribs or straw-house.

The oat crop thus cleared off, and which usually yields from four to ten quarters per acre, is the last of the five-shift rotation, when the same proceedings and course of cropping is recommenced, as has been already detailed.

The defects of this system of cultivation are, as already said, having two white crops together, too many raised for sale, and too few green crops for home consumption. Consequently, a sufficient number of live stock cannot be kept to make dress enough to keep the land in heart, and thereby increase the general fertility of the farm; and yet, notwithstanding the defects and positive loss sustained by an adherence to this system, many extensive farms on the diluvial formation are still conducted according to this irrational custom: nay, more, many tenants are compelled by the terms of their leases, or agreements, to follow this system and no other!

But within the last twenty years, a change has been gradually taking place, by introducing what is called the Norfolk or *four-shift* rotation; and which is merely by throwing oats out of the rotation, which allows fallowing for turnips and other green crops every fourth instead of every fifth year. This prevents the accumulation of weeds, which always appear among the oats—renders fallowing an easier process, and the succeeding crops more abundant, in consequence of a more numerous head of live stock being kept and fed for sale. More pastures have been laid down; drilling the crops instead of broadcasting has been adopted; and improved implements of several kinds, and for various purposes, have been invented and introduced into the business of farming.

These improvements were partially begun fifty years ago, and fully carried out at Holkham, Woburn Abbey, and at many other places; so that both the practice and knowledge of agriculture have been widely diffused by imitating the examples set by the noble owners of the above-named places, under the superintendence of Mr Blaikie, at Holkham, and of the late Messrs Wilson and Sinclair at Woburn. To these eminent practical and botanical agriculturists have succeeded a numerous class of their pupils and followers, who are disseminating their opinions and practices far and wide. So that it may be truly said that agriculture is making rapid strides towards all practical perfection in the central counties of England, where it has hitherto been behind both the northern and eastern counties. In furtherance of this progressive improvement, the Royal English Agricultural Society, with the extensive influence of its members, will greatly contribute to reform what is still amiss or inexpedient in the leasing of farms, as well as in recommending the best practices.

The soil of the Duke of Bedford's farms in the vicinity of Woburn is a fine sandy loam, chiefly arable: it was, and I believe still is, managed under the following course of cropping, namely, 1. Turnips, on a dunged fallow, sown in drills 27 inches apart; 2. Barley, with broad-clover; 3. Clover, either soiled with sheep, or made into hay; 4. Wheat, sown on a stale furrow, well harrowed down, and in drills 9 inches apart; 5. Turnips as before; 6. Barley, with clover and trefoil; 7. Clover, &c., depastured with sheep; 8. Pease, drilled; and, 9. Wheat, which ends the course.

The turnip ground is prepared with much labour, thoroughly and repeatedly ploughed until it is quite pulverized, as well as cleared of root-weeds. The drills are first opened by a double-breasted plough; the dung is then carted on, and spread along the bottom of the drills, and the ridges between are split right and left to cover the dung, and over which the seed is drilled. The intervals are stirred by horse-hoe, and the plants are set out with the hand-hoe.

The crop is partly drawn for feeding cattle, and partly eaten with sheep; each intermediate row being drawn for the former purpose. Along with the turnip-crop, No. 5, as much ground is sown with winter-tares as will suffice for cutting green in May; and which ground is afterwards sown with turnips.

In the execution of this course of cropping there is one particular which may be noticed; it is, in ploughing the leys a skim-coulter is always used. This addition to the plough lays the clover, stubble, and weeds in the bottom of the open furrow, to be completely buried by the next slice. The same is done for the pea-crop, which gets the roots of the clover out of the way of the drill-shares. From two to three bushels are sown, are kept clean by horse and hand-hoes, and are fit to reap or pick in July, with a hook in each hand of the reaper, one to hold up the straw, and the other wielded horizontally to separate it from the ground. The crop is rolled into small wads or bundles, and require turning once or twice before being ricked.

In this country pease are a precarious crop, being subject to be attacked by the *aphides* in dry summers, and often exposed to frequent showers in July, either of which casualties are fatal to the crop. On heavy clayey soils pease do better; their rank growth on such land, offends the aphides, and ripening later in August, escape the July rains.

In the above course pease occur only once in nine years, and wheat only twice, which, from the high condition of the land, is not considered too often; and as broad-clover is only sown and mown once, there is no fear of sickening the soil with it.

As there is always an opportunity of having a two-year old ley, or a portion of worn-out pasture to break up, such portions of the farm are invariably appropriated to the production of oats. When old pastures are broken up in order to be laid down again with the best grasses, the ground undergoes the following course of culture and cropping. The sward is ploughed in December, and when mellowed by the frost, is well harrowed and sown with five bushels of the Poland variety to the acre. The crop is heavy, and though cut with the scythe is afterwards bound in sheaves,—the yield eight or nine quarters per acre. The oat-stubble is ploughed soon after harvest, and immediately harrowed, in which state it remains till the beginning of November, when it is ploughed a second time, laying the lands as high in the middle as can be done. Soon as spring weather invites, the field is again harrowed and sown with beans in drills 27 inches apart, requiring three bushels to the acre. The growing crop is kept clean by the horse and hand hoes; the crop is reaped, and bound in sheaves, yielding about forty bushels to the acre. Soon as the beans are off, the ground is scarified by a powerful implement going as deep as the plough. If the scarifier brings any weeds to the surface, they are picked off, and then the land is in order to be ploughed and sown with wheat in October. The seed is drilled at twelve-inch intervals; this distance being found best for autumn sowing.

The wheat-stubble is immediately begun to be prepared for turnips cultivated as before detailed; and these, when consumed, are followed by barley, and sown with permanent grasses to form the new meadow.

If a field, intended to receive a similar process of conversion to arable, and reconversion into meadow, be inferior in quality, the succession of crops is somewhat different,—as follows:—1st, Oats; 2d, Turnips; 3d, Barley; 4th, Clover for soiling or hay; 5th, Wheat; 6th, Turnips; 7th, Barley and seeds, for permanent pasture.

Grass-land, if sufficiently extensive, is divided into any number of equal portions, and mowed in rotation; that portion to be mowed always receiving a dressing of good rotten dung in the winter previous. By this management no part is impoverished by cutting too frequently; and when cut for hay, the crop is always abundant, usually yielding from one and a-half to two and a-half tons to the acre.

Hay-making is well understood, and well performed in England. It is indeed reduced to a regular system, when weather allows, and which is as follows, viz.

When the day is fixed for the mowers to begin, they are at their work as early as 4 o'clock in the morning; the makers, mostly women and boys, turn-to after breakfast, and with small forks ted out all the grass mown before breakfast. This tedding is done very carefully and equally over all the surface, and in the course of the forenoon it is turned once or twice. In the afternoon it is raked into single wind-rows, each raker taking about three feet in width of the tedded grass, and thereby leaving clear spaces between. When the wind-rowing is finished, the rows may be turned once, if there is time; but every row must be run into grass-cocks before sunset.

On the second day, the first work is tedding out all that was mown after breakfast on the first, and up to the same time on the second day. Next the grass-cocks are shaken out into staddles, or long-beds, four or five yards wide, leaving a clear space between the staddles raked clean. These are turned once or twice during the forenoon; and that which was tedded in the morning is turned once or twice, wind-rowed, and at last made into grass-cocks for the night. After dinner the staddles are raked into double wind-rows, and before sunset are made into cocks twice or thrice the size of grass-cocks.

On the third day, the work of tedding out, wind-rowing, shaking out into staddles, shaking out the large cocks, and turning these last from time to time to the sun and air, the hay will be in good order to be carried to the rick about four o'clock afternoon. This is the usual process, every day's mowing becoming fit, with the necessary attendance, to be carried on the third or fourth day after mowing. This, it may be thought, is an expeditious way of getting up hay; but if the weather be fine, it is the usual course in the south of England. I have often made scores of acres in a season, without making a single cock; but in uncertain weather it is impossible to go on safely without cocking-up every night.

Hay-ricks are generally built rectangular, about six yards wide, and of any convenient length, say seven, eight, or nine yards, according to the quantity wished to be put together. Square ricks are most suitable for binding into trusses three feet long and two feet over; the thickness varies according to the closeness or hollowness of the hay. Each truss weighs

56 lbs., thirty-six of which make what is called a load in the markets. (For the method of binding, see a paper of mine in vol. iii. p. 850 of this Journal.)

In some of the eastern counties, the hay is put up in large cocks in the rick-yard, or in a corner of the field in which it is made. These being well pulled, very little straw is required for thatching, and that only on the crown of the cock. Whereas square ricks have the whole roof thatched, consuming much straw, and causing expensive labour.

As grass-land is invaluable to the arable farmer, as enabling him to keep more live stock, so has it been particularly guarded by restrictive clauses in leases. But sometimes old grass becomes mossy and unprofitable. In this case, a renewal of the sward is necessary; and in order that this may be effectually performed, the land undergoes a preparation and course of cropping, as has been already detailed.

The system which has now gained the title of "*convertible husbandry*," that is, the conversion of grass-land into arable, and its reconversion into grass, is no doubt an improvement of the old system; because there is certainly much heavier crops of corn produced on the newly broken-up land during the transition, and when again laid down, larger crops of grass of the most approved species. Great advances have been made in the choice and collection of the seeds of the best grasses since the publication of our friend the late Mr G. Sinclair's *Hortus Gramineus Woburnensis*. Farmers are now well aware how much it is to their advantage to deal with a respectable seedsman, who can serve them with pure samples of the sorts they want, and which are most suitable for the land they cultivate.

Permanent pasture is advised to be sown with the following kinds and quantities of seeds per acre, viz. 10 lbs. white clover, 3 lbs. trefoil, 2 lbs. rib-grass, and 3 pecks cock's-foot; or instead of the latter, 1 peck perennial rye-grass, or 3 pecks meadow-fox-tail, and 1 peck rough-stalked meadow-grass. These together are a very liberal quantity for an acre; but as seedling grasses are subject to many casualties, erring on the safe side is commendable.

Besides the above species, there are a few others which are found in the best pastures, and recommended to be sown, namely, smooth-stalked meadow, sweet-scented vernal, meadow fescue, and golden oat-grass.

Italian and several other superior varieties of rye-grass have lately been introduced into cultivation for ordinary purposes, and are by many farmers highly approved. The flesh-coloured clover introduced about the same time has been fairly tried, but has not realized the expectations entertained of it as a green forage plant.

The rough cow-parsnip, and Bokhara and flesh-coloured clover, as forage plants, have all been tried, and all have had or still have their admirers; but as yet there are no signs of either being admitted into the regular routine of farming.

Having given an outline of the usual proceedings of English farmers on the almost obsolete five-course system, and the gradual change to the Norfolk or four-course shift, I may add, concerning the latter, that this also begins to be less popular than it was at first. It is objected that, in this rotation, clover occurs too frequently, and the consequence is, that the land is everywhere getting *sick* of it, so that a really good crop of clover is rarely to be seen. Changing the kinds of clover, that is, substituting the white and yellow species instead of the red every alternate fourth year, is found not to be so effectual as it was once presumed to be; and other rotations have been devised, one of which is that suggested by the experienced Mr Morton for light turnip soils.

1. Turnips and Swedes on a manured fallow.
2. Barley and seeds.
3. The seeds pastured with sheep or other live stock.
4. Second year seed, also pastured by sheep or other do.
5. Oats.
6. Potatoes, mangel-wurzel, beans, or winter tares, dunged.
7. Wheat.

The superiority of this round of cropping consists in there being only three crops of corn taken in the course of seven years, and which, from their so seldom occurring, are likely to be extraordinarily abundant; nor will the land be exhausted of the nourishment corn particularly requires, when so seldom called upon. The intervening crops are either resting, cleansing, or otherwise ameliorating products, and, when disposed of to live stock at home, return as great a profit in the shape of wool, mutton, and beef, as the corn grown on the same land would have done if carried to market. And, moreover, the land would be kept in constant better heart and higher state of cultivation.

Very little rye is sown, an acre or two of the wheat land only being devoted to it, but never admitted as an object in the rotation. It is an exhausting crop, though profitable, as far as it goes, when the straw can be sold to the *plaiters* or the mattress-makers. Rye, as well as bere, is sometimes sown for sheep-keep, but tares or cole-seed are mostly preferred for such purposes.

The cultivation of hemp and flax are quite given up in the south of England; but there are various districts in which saffron is grown for the druggists, as well as liquorice; and for clothiers, the teazel; and poppies for the apothecary: all of which are as profitable as common farming, otherwise they would not be cultivated. In some places, as in the neighbourhood of Colchester, in the county of Essex, many farmers turn their attention to growing garden and agricultural seeds for the London seedsmen, which is said to be a profitable pursuit. Rape and mustard are cultivated in various places in the northern counties, and brank on the light lands of the south.

Hops are extensively cultivated on the rich lands of Kent, Sussex, and Surry in the south, and Worcester and Gloucester shires in the west. In the same counties the production of fruit, from the filbert-nut up to the luscious fig, are important items in the profits of farms, and, though all of a precarious character, are still trusted to as sources of income.

The circumstances of English farmers are as various as are their persons. When untiring industry and steadiness of conduct are united with a competent capital, all may go on well, but capital without practical knowledge is very rarely successful. We have witnessed many attempts of amateur farmers to introduce what they called the Scotch system of farming into England. Not only the modes of ploughing and sowing, reaping and mowing, thatching and stacking, &c., but every other adjunct of men, implements, cattle, with all the paraphernalia of the *bothie* system, even to an old Ellen to sweep the house. The low nominal rents of many parts of England were seductive to many half-informed Scotch farmers, who too eagerly engaged English farms; but when called upon for their quotas of tithe, poor-rates, church and county rates, together with the higher prices of necessaries and of labour, they found themselves deceived; and when they thought of shielding themselves from the two latter items of cost by the introduction of their own countrymen and customs, in this they were also defeated by the desertion of their men for better engagements in the neighbourhood, and fresh importations only served to linger out an attempt which was so different from the customs of the country where tried, and where it could not be pleasantly carried out. But still Scotch farming and Scotch farmers are much respected; the first, for the economy with which it is conducted, and the second, for their intelligence and steady character. But in countries which differ so much in manners and customs, and particularly in the modes of paying farm-servants, the one entirely in money, and the other partly in money, but chiefly in provisions, must make uniformity in the success of the masters, as well as in the views, habits, and moral conduct of the labourers impossible. It often happens, from the improvident mismanagement of the English labourer, that towards the end of the week, his cottage, if he has a family, contains none of the comforts of a home to him, no resources of either "meal or malt" to lean upon, and only looking forward for Saturday night, to receive his ten or twelve shillings, which are mostly dissipated before he receives them. This improvidence has been chiefly brought about by the leniency of their old poor-laws, and though these laws are now more stringent, dependence upon the overseer will never be obliterated until the present generation has passed away.

English labourers are, however, a most useful and hard-working class of men, and, when working by the piece, indefatigable; they excel in all the various labours of the husbandman, and many of them fare hard as well as work hard merely because they must have the most costly food. Very few of them have any education; but the rising generation will be greatly improved in this respect, from the more general diffusion of elementary knowledge.

THE WORKS OF SIR HUMPHRY DAVY RELATING TO AGRICULTURE.

By Cuthbert W. Johnson, Esq., F.R.S., Corresponding Member of the Agricultural Society of Koningsberg, the Horticultural Society of Maryland, &c.

The chief and most enlightened English farmers of the commencement of the present century, were perhaps the first numerous body of cultivators who saw pretty clearly the probable advantages to be derived by agriculture from the assistance of chemical investigation. Several events had materially tended to create this very desirable feeling. Dr Priestley had just then discovered the effects produced by the atmospheric gases upon vegetation; and other distinguished chemists, excited by his example, had successfully entered upon the same important field of research. The celebrated Arthur Young, too, with but very imperfect materials, and but a very slight chemical knowledge, had attempted to apply some of these discoveries to the operations of the field. Other great agriculturists, such as the Duke of Bedford, Sir John Sinclair, and Lord Leicester, with still less knowledge of chemistry than Arthur Young, endeavoured to follow in the same judicious course of combining practice with science. And if these great benefactors of their country attained greater success than Arthur Young, it was chiefly because, with more powerful means at command, they attended to fewer objects at the same time—were not so often diverted away from great objects by novel attempts, as the ever restless, energetic Secretary to the Board of Agriculture.

It was to such men as these that the farmer is indebted for the agricultural chemistry of Davy; for if they had not supported him so nobly as they did, those excellent lectures, which finally constituted his great work on the Chemistry of Agriculture, might never have been delivered. To the Managers, then, of the long since departed Board of Agriculture, and to the Royal Institution of Albemarle Street, the farmer must chiefly attribute the production of a work which still remains the most scientific and systematic chemical work on agriculture.

No man could have been chosen better fitted for such a task than Sir Humphry Davy. With talents of the highest order, he approached the investigation of the many mysteries of vegetation with all the cool caution of the philosopher. Possessing, too, as he did, an utter contempt for mere verbiage, he felt, and he felt truly, that the great object he had in view—that of bringing the resources of science to the assistance of the cultivator—would be best accomplished by avoiding all technical language, all that even approached the jargon of the alchemists. He laboured to be understood by the mass—by those whom his agricultural chemistry was intended to assist; and with what success, let his admirable work on agricultural chemistry bear witness. It is to that volume that this paper will be chiefly devoted, although I feel it would be a grateful task to follow him through all his brilliant career as a chemical philosopher—to mark his triumphs in chemical discovery—his noble efforts in behalf of the science of chemistry, of the manufacturers of his country, of the miner, and of many other classes. These great and numerous achievements have been carefully noted in the biographical sketches, by his brother Dr John Davy, and Dr Paris. It is to these works that I am chiefly indebted for the brief notices which I shall insert in this essay.

Davy was born at Penzance in 1778; and from an early period, it seems, afforded another illustration of the common observation, that the boy is usually the epitome of the man. From his very youthful days he had a love of research—was warmly attached to chemistry and geology—loved disputation of all kinds—delighted in fishing—never could succeed in learning the military exercise—had not the slightest ear for music, yet wrote poetry. Apprenticed to a surgeon at Penzance, he tried experiments of all kinds, utterly regardless of danger, even on explosive mixtures, which, on more than one occasion, endangered all the bottles of the dispensatory. He owed through life but little to good fortune. He had indeed many difficulties to encounter before he became celebrated as a chemist; and it is to the late Davies Gilbert that the farmer is perhaps indebted for Humphry Davy. For the late excellent President of the Royal Society was the first who discovered and successfully encouraged the talents of the young philosopher. Through the patronage of this gentleman, Davy was engaged by the late Dr Beddoes as an assistant at the Pneumatic Institution at Bristol, where he speedily became distinguished, and from whence he was chosen at first an assistant, and afterwards Professor of Chemistry at the Royal Institution in Albemarle Street. At Bristol, it has been well remarked, Davy's poetical imagination displayed itself with all the luxuriance of youth; in fact, in his early career with Dr Beddoes, both of these zealous philosophers too often suffered themselves to be led away by their ardent imaginations to the adoption of hasty, ill-digested theories—an error which Davy ever afterwards carefully guarded against with a success which more modern authors on agricultural chemistry have not always attained. Davy, in after life, was ever ready to acknowledge these mistakes. He gracefully alluded to them in one of his lectures at the Royal Institution, when he observed to his brilliant and crowded audience—"After what has been said, it will be useless to enter upon an examination of any of those theories which, assuming for their foundation the connection of life with respiration, have attempted to prove that oxygen is the principle of life, and that the wonderful and mysterious phenomena of perception arise from the action of common gravitating substances upon each other. Such theories are the dreams of misemployed genius, which the light of experiment and observation has never conducted to truth, and are merely a collection of terms derived from known phenomena, and applied by loose analogies to unknown things."

It was in 1801 that Davy became assistant lecturer in chemistry at the Royal Institution of London, an appointment from whence may be dated the commencement of his highly useful and brilliant career. From the first, however, he laboured under many personal disadvantages—he was ever exceedingly timid, and had long an awkwardness of manner, which he with difficulty overcame. Dr Paris alludes to these drawbacks on his early success, when he says:—"His uncouth

> appearance and address subjected him to many mortifications on his arrival in London. There was a smirk on his countenance, and a pertness in his manner, which, although arising from the perfect simplicity of his mind, were considered as indicating an unbecoming confidence. Johnson, the publisher, was in the custom of giving weekly dinners to the more distinguished authors and literary stars of the day. Davy, soon after his appointment, was invited upon one of these occasions, but the host actually considered it necessary to explain, by way of apology, to his company, the motives which had induced him to introduce into their society a person of such humble pretensions. At this dinner a circumstance occurred, which must have been very mortifying to the young philosopher. Fuseli was present, and, as usual, highly energetic upon various passages of beauty in the poets, when Davy most unfortunately observed, that there were passages in Milton which he never could understand. 'Very likely, very likely, Sir,' replied the artist in his broad German accent, 'but I am sure that is not Milton's fault.' "—(*Dr Paris*, vol. i. p. 121.)

It was about this time that his old and long attached friend Poole, of Nether Stowey, when describing Davy, mentions the first attention which he paid to agriculture; he remarks, "I recollect on our first acquaintance, he knew but little of the practice of agriculture. I was at that time a considerable farmer, and very fond of the occupation. During his visits in those days I was at first something like his teacher, but my pupil soon became my master both in theory and practice."

In a letter to Mr Poole, dated in May 1803, I find the first allusion to his proposed agricultural works. He says,—"When my agricultural lectures are finished, I propose to visit Paris, and perhaps Geneva. Often, very often, in the midst of the tumults of the multitude in this great city has my spirit turned in quietness and solitude towards you. I hope soon to see you in Somersetshire, where we may worship nature and the spirit that dwells in nature in your green fields, and under your tranquil sky."—*Dr Paris*, vol. i. p. 177. These lectures were from the first, it appears, very popular; many brief notices of them attest this fact. Thus in the manuscript notes of Arthur Young, is inserted this note, "*May* 13. 1803. Two lectures by Mr Davy have taken place, and been very well attended. They (the Board of Agriculture ?) intend retaining him by a salary of one hundred pounds a-year—a very good plan." There is, according to Dr Paris, at Bradfield

Hall (once the residence of Arthur Young), a small quarto pamphlet of fourteen pages, entitled, "Outlines of a course of lectures on the chemistry of agriculture to be delivered before the Board of Agriculture in 1803." This was evidently only printed for private circulation amongst the members. At the same time, Davy printed a small pamphlet containing an explanation of the terms used in chemistry for the instruction of those amongst his audience who had not particularly directed their attention to the science. The first lecture was delivered on Tuesday, May 10, and five others on the succeeding Tuesdays and Fridays.*

The mass of interesting facts which Davy illustrated in those celebrated lectures speedily attracted the attention of the Board of Agriculture. Sir John Sinclair, in April 1806, when reviewing the various objects to which the attention of the Board had been directed, remarked,—"In the year 1802, when my Lord Carrington was in the chair, the Board resolved to direct the attention of a celebrated lecturer, Mr Davy, to agricultural subjects, and in the following year, during the presidency of Lord Sheffield, he first delivered to the members of this institution a course of lectures on the chemistry of agriculture. The plan has succeeded to the extent which might have been expected from the abilities of the gentleman engaged to carry it into effect. The lectures have hitherto been exclusively addressed to members of the Board; but to such a degree of perfection have they arrived, that it is well worthy of consideration whether they ought not to be given to a larger audience. If such an idea met with the approbation of the Board, a hall might be procured for that purpose, or a special course of lectures read in this room exclusively for strangers."

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* His connection with the Board of Agriculture, says Dr Paris, necessarily brought Davy in contact with the practical agriculturists and capitalists of the day, with many of whom he formed friendships which lasted through life. With Lord Leicester he became well acquainted, and generally formed one of the party at his annual sheep-shearing. He was also a frequent visitor at Woburn, and received from the Duke of Bedford the means by which he was enabled to submit to the test of practice various theories which his science had suggested. In the print of "the Woburn Sheep-Shearing," published in 1811 by Garrard, No. 75 represents Davy. He is standing in a listening attitude behind the late Lord Leicester, who is conversing with Sir Joseph Banks, Sir John Sinclair, and Arthur Young. Shortly after his arrival in London, he formed an intimate friendship with the late Sir Thomas Bernard, who allotted to him a considerable portion of ground near his villa at Roehampton, where, under his sole direction, numerous experiments were tried, many of which proved highly successful, and afterwards served for the illustration of various subjects in his Agricultural Chemistry. Davy also was the friend and constant visitor of the late T. A. Knight at Downton, where he seemed to enjoy himself fishing for grayling in a very quiet philosophical manner. "In the familiar conversations of these friendly visits," remarks Mr Knight, "he always appeared to me to be a much more extraordinary being than even his writings and vast discoveries would have led me to suppose him; and in the extent of intellectual powers, I shall ever think that he lived and died without an qual."—(*Dr Paris*, vol. i. p. 323.)

"Davy," continues Dr Paris, vol. i. p. 180, "would appear to have been very early impressed with the importance of chemistry, in its various applications, to agriculture. Allusions are constantly made to it in his letters; and at the conclusion of his Researches, Chemical and Philosophical, chiefly concerning nitrous oxide (the laughing gas), he glances at this department of the chemistry of vegetation, and observes, that 'although it is immediately connected with the art upon which we depend for subsistence, it has been but little investigated.'"

The substance of these highly important lectures were published in an octavo volume in 1812, with the title, "Elements of Agricultural Chemistry, in a course of lectures for the Board of Agriculture." He slightly notices the history of these lectures in his preface, when he says,—"During ten years, since 1802, I have had the honour, every session, of delivering courses of lectures before the Board of Agriculture. I have endeavoured at all times to follow in them the progress of chemical discovery; they have, therefore, varied every year; and such is the rapidity with which chemistry is extending, that some alterations and improvements were rendered necessary at the time they were preparing for the press. The Duke of Bedford," he adds, "has enabled me to stamp a value upon this work, by permitting me to add to it the results of the experiments instituted by his Grace upon the quantity of produce afforded by the different grasses" (alluding to the report of the laborious and valuable experiments long carried on in the grass garden at Woburn, by the late George Sinclair, which form the appendix to his volume).

Throughout this valuable work, there is, as I have already observed, an evident anxiety displayed by the author to be clear, cautious, and practical. "An ethereal clearness of style," says Dr Paris, "a simplicity of language, and, above all, a freedom from technical expression, which render his philosophical memoirs fit studies and models for all future chemists." That he laboured hard to attain this simplicity of language is evident from what he remarks in his "Last Days of a Philosopher." "In detailing the results of experiments, and in giving them to the world, the chemical philosopher should adopt the simplest style and manner; he will avoid all ornaments, as something injurious to his subject, and should bear in mind the saying of the first King of Great Britain, respecting a sermon which was excellent in doctrine, but overcharged with poetical allusions and figurative language, 'that the tropes and metaphors of the speaker were like the brilliant wildflowers in a field of corn, very pretty, but which did very much hurt the corn.'"

The Elements of Agricultural Chemistry is divided into eight sections or lectures, each of which will well repay the often-repeated perusal of the farmer, for he may find in these valuable researches, not only an explanation of most of the agricultural processes he is daily witnessing, but it is more than probable that he may hence derive valuable suggestions for either the adoption of better modes of tillage or for the profitable variation of others with which he has long been acquainted. Agricultural chemistry, in fact, as Davy himself defines it, includes too many questions with regard to vegetation, not to be highly interesting to the cultivator, for "It has for its objects all those changes in the arrangements of matter connected with the growth and nourishment of plants; the comparative values of their produce as food; the constitution of soils; the manner in which they are enriched by manure, or rendered fertile by the different processes of cultivation. Inquiries of such a nature cannot but be interesting and important both to the theoretical agriculturist and to the practical farmer. To the first they are necessary in supplying most of the fundamental principles on which the theory of the art depends. To the second they are useful in affording simple and easy experiments for directing his labours, and for enabling him to pursue a certain and systematic plan of improvement. It is scarcely, in fact, possible to enter upon any investigation in agriculture without finding it connected, more or less, with doctrines or elucidations derived from chemistry."

Davy had heard the often-repeated trite objections to the union in agriculture of science with practice, and he felt the primary importance of removing these once popular objections. In his opening lecture, therefore, he told his readers very truly, when speaking of agriculture, that "This art will advance with rapidity in proportion as it becomes exact in its methods. As in physical researches all the causes should be considered,—a difference in the results may be produced even by the fall of half an inch of rain, more or less, in the course of a season, or a few degrees of temperature, or even by a slight difference in the subsoil, or in the inclination of the land.

"It is no unusual occurrence for persons who argue in favour of practice and experience to condemn, generally, all attempts to improve agriculture by philosophical inquiries and chemical methods. That much vague speculation may be found in the works of those who have lightly taken up agricultural chemistry it is impossible to deny. It is not uncommon to find a number of changes rung upon a string of technical terms, such as oxygen, hydrogen, carbon, and azote, as if the science depended upon words rather than upon things; but this is in fact an argument for the necessity of the establishment of just principles of chemistry on the subject.

"It has been said, and undoubtedly with great truth, that a philosophical chemist would most probably make a very unprofitable business of farming; and this certainly would be the case if he were a mere philosophical chemist, and unless he had served his apprenticeship to the practice of the art, as well as to the theory. But there is reason to believe, that he would be a more successful agriculturist than a person equally uninitiated in farming, but ignorant of chemistry altogether, his science, as far as it went, would be useful to him.

"In proportion as science advances, all the principles become less complicated, and consequently more useful. And it is then that their application is most advantageously made to the arts. The common labourer can never be enlightened by the general doctrines of philosophy, but he will not refuse to adopt any practice of the utility of which he is fully convinced, because it is founded upon those principles. The mariner can trust to the compass though he may be wholly unacquainted with the discoveries of Gilbert on magnetism. The dyer will use his bleaching liquid even though he is perhaps ignorant not only of the constitution but even of the name of the substance on which its powers depend. The great purpose of chemical investigation in agriculture ought undoubtedly to be the discovery of improved methods of cultivation. But, to this end, general scientific principles and practical knowledge are alike necessary. The germs of discovery are often found in rational speculations; and industry is never so efficacious as when assisted by science. There is no idea more unfounded than that a great devotion of time, and a minute knowledge of general chemistry, are necessary for pursuing experiments on the nature of soils or the properties of manures. Nothing can be more easy than to discover whether a soil effervesces, or changes colour, by the action of an acid, or whether it burns when heated, or what weight it loses by heat; and yet these simple indications may be of great importance in a system of cultivation. The expense connected with chemical inquiries is extremely trifling—a small closet is sufficient for containing all the materials required. The most important experiments may be made by means of a small portable apparatus; a few phials, a few acids, a lamp and crucible, are all that is necessary. It undoubtedly happens in agricultural chemical experiments conducted after the most refined theoretical views, that there are many instances of failure for one of success; and this is inevitable from the capricious and uncertain nature of the causes that operate, and from the impossibility of calculating on all the circumstances that may interfere; but this is far from proving the inutility of such trials. One happy result which can generally improve the methods of cultivation is worth the labour of a whole life, and an unsuccessful experiment well observed, must establish some truth or tend to remove some prejudice. Discoveries made in the cultivation of the earth, are not merely for the time and country in which they are developed, but they may be considered as extending to future ages, and as ultimately tending to benefit the whole human race; as affording subsistence for generations yet to come, as multiplying life, and not only multiplying life, but likewise providing for its enjoyment."

It was in such language that Davy ardently laboured in his opening lecture, to convince the cultivators of his country of the importance of calling to their assistance the aid of the chemist. His labours in this respect were not unsuccessful; and although he was the first who produced a work on the chemistry of agriculture, and had in consequence no precedent to guide him in the arrangement of his valuable materials, yet he succeeded to a very great extent in convincing the farmer of the value of the research, induced many to obtain a general knowledge of chemical truths, and impressed a still more numerous body of farmers with the importance of the theme. And even this consummation was attended with very considerable advantages to agriculture, for, by this means, a ready attention was obtained for future chemical investigators, in the same great and invaluable field of research—and this, as a natural consequence, excited fresh exertions, for the chemical philosopher now felt that he was not labouring in a barren soil, that his experiments would not be unheeded, or their importance underrated, but that they would, on the contrary, be closely examined, and carefully repeated by a numerous and accomplished body of agriculturists.

Having, in his first section, succeeded so clearly in demonstrating the important aid which might be derived from the application of chemistry to the improvement of the cultivator's processes, Davy proceeded practically to apply the facts and the doctrines of vegetable chemistry; and, to this end, he advanced in the most systematic manner, yet employing on all occasions the most familiar, easily understood, language. In his second section, therefore, he examines what is in fact the foundation of all vegetable chemistry, the effects produced by the influence of the general powers of matter, meaning by this, chemical attraction or gravity, heat, light, electricity, and also the undecomposed or simple substances found in vegetables, with the laws of their combinations and arrangements.

In this lecture, which abounds with highly interesting and skilfully arranged matter, the agriculturist will find no incomprehensible sentences, no alchemy, no mystic symbols, or algebraical calculations, to retard or disgust him. Davy threw aside all these, and spoke in the language of a philosopher, in simplicity; and as if he indeed wished the farmers of his country to understand him, he combated zealously the idea that there is any thing difficult to be understood in chemistry. He thus concludes his second chapter:—" For pursuing such experiments on the composition of bodies as are connected with agricultural chemistry, a few only of the undecomposed substances are necessary; and amongst the compounded bodies, the common acids, the alkalies, and the earths, are the most essential substances. The elements found in vegetables, as has been stated in the introductory lecture, are very few.

" The doctrine of definite proportions, as will be shewn in the following lectures, will assist us in gaining just views respecting the composition of plants and the economy of the vegetable kingdom; but the same accuracy of weight and measure, the same statical results which depend upon the uniformity of the laws that govern dead matter, cannot be expected in operations where the powers of life are concerned, and where a diversity of organs and of functions exists. The classes of definite inorganic bodies, even if we include all the crystalline arrangements of the mineral kingdom, are few compared with the forms and substances belonging to animated nature. Life gives a peculiar character to all its productions, the power of attraction and repulsion, combination and decomposition, are subservient to it, a few elements by the diversity of their arrangement are made to form the most different substances, and similar substances are produced from compounds, which, when superficially examined, appear entirely different."

Davy was thus evidently aware of the caution necessary to be exercised by the chemist when he is examining the chemical operations incessantly carrying on in living matter; he had investigated these with the most anxious attention, during a long and brilliant career; but he ever approached the theme with extreme caution, and expressed himself, when dwelling upon it, with the humble and graceful simplicity of the true philosopher. It was ever, however, a subject of interest with him. Thus, in his last work, entitled "Consolations in Travel, or the Last Days of a Philosopher," written as it were on his deathbed, he observed, p. 193,—" In physics and in chemistry, the science of dead matter, we possess many facts and a few principles or laws, but whenever the functions of life are considered, though the facts are numerous, yet there is, as yet, scarcely any approach to general law; and we must usually end where we begin, by confessing our entire ignorance;" and when, in another place, alluding to some theories which had been propounded by way of explaining these difficulties, he remarked very truly, "such notions are unphilosophical and the mere substitution of unknown words for unknown things."

The third section of the Elements of Agricultural Chemistry comprehends the organization of plants and their constituents; the substances detected in the roots, stems, leaves, flowers, and seeds. In this chapter, he brings together every fact, every experiment which he deemed likely, in this branch of his subject, to interest the farmer. Examines in detail not only the purely vegetable substances, such as starch, sugar, gum, vegetable acids, &c., but all the substances found in plants, such as the earths, alkalies, metallic oxides, salts, &c. He adds also the analysis of several of the commonly cultivated crops of the farmer, and offers many valuable suggestions for their increased production.

The fourth section of "the Elements" is devoted to the chemical examination of the soil,—its analysis, use, the rocks or strata by whose decomposition it is found, and on which it rests, and lastly, of its improvement. There is hardly a page of this valuable lecture that does not afford ample materials for quotation; for here Davy having ceased to be surrounded, as in the previous section, with the many mysterious processes of living vegetables, and treating only of the earths or their mixtures, becomes naturally more clear in his conceptions, and still more practical in his suggestions. He was ever anxious to cheer on the young chemist on all occasions, warns the mere student in agricultural chemistry not to be disheartened by their primary difficulties. Thus, he says, p. 174,—"In the first trials that are made by persons unacquainted with chemistry, they must not expect much precision of result. Many difficulties will be met with; but, in overcoming them, the most useful practical knowledge will be obtained, and nothing is so instructive in experimental science as the detection of mistakes. In pursuing his experiments, he will be continually obliged to learn the properties of the substances he is employing or acting upon; and his theoretical ideas will be more valuable in being connected with practical operations, and acquired for the purpose of discovery."

Davy was the first who dwelt upon the importance of the insensible vapour of the atmosphere to vegetation, and of the absorption of that insensible moisture, by the finely divided soils of the cultivator. He laboured also to convince the farmer of the importance of *permanently* improving their lands; and his observations on this head, forming the concluding ones of the lecture, can hardly be too often studied.

"The best natural soils are those of which the materials have been derived from different strata, which have been minutely divided by air and water, and are intimately blended together; and, in improving soils artificially, the farmer cannot do better than imitate the processes of nature. The materials necessary for the purpose are seldom far distant; coarse sand is often found immediately on chalk, and beds of sand and gravel are common below clay. The labour of improving the texture or constitution of the soil, is repaid by a great permanent advantage; less manure is required, its fertility insured, and capital laid out in this way secures for ever the productiveness, and consequently the value of the land."

Having elaborately treated of the properties of the soil, and its uses to vegetation, Davy, in his fifth chapter or lecture, proceeded to examine the nature and constitution of the atmosphere and its influence on plants,—traces the progress of vegetation, from the germination of the seed, throughout its subsequent growth, until it attains maturity and finally decays, very modestly hoping in his opening remarks, that the pursuit of these important objects might "offer some objects of practical use in farming, and present some philosophical illustrations of the manner in which plants are nourished, their organs unfolded, and their functions developed."

In this valuable portion of his work, he not only traces the chemical phenomena of vegetation developed in the healthy plant, but in its diseased state,—follows with much skill the progress of its diseases, and examines the more common "parasitical plants," and "the animal destroyers and tyrants" of the vegetable kingdom. In this important investigation, the well-regulated mind of Davy could find sources of consolation even in the ravages of the mildew, or the devastations of the turnip-fly. He remarked, in allusion to these, "In general, wet weather is most favourable to the propagation of mildew, funguses, rust, and the small parasitical vegetables; dry weather to the increase of the insect tribes. Nature, amidst all her changes, is continually directing her resources towards the production and multiplication of life, and in the wise and grand economy of the whole system, even the agents that appear injurious to the hopes and destructive to the comforts of man, are, in fact, ultimately connected with a more exalted state of his powers and his condition. His industry is awakened, his activity kept alive, even by the defects of climates and season. By the accidents which interfere with his efforts, he is made to exert his talents to look further into futurity, and to consider the vegetable kingdom not as a secure and unalterable inheritance, spontaneously providing for his wants, but as a doubtful and insecure possession, to be preserved only by labour, and extended and perfected by ingenuity."

In his sixth lecture he embraces the question of manures, a theme perhaps the most interesting to the farmer of the many embraced and illustrated by the science of chemistry. In this valuable section he dwells, in his usual excellent cautious manner, on manures of vegetable and animal origin—of the manner in which these manures become the nourishment of the plant—of the fermentation and putrefaction of organic substances—of mixed manures—and of the general principles with respect to the use and application of such fertilizers.

Davy felt the great value of the subject to the tiller of the soil. "I shall endeavour," he observed, "to lay down some settled principles on these objects; they are capable of being materially elucidated by the recent discoveries in chemistry, and I need not dwell on their great importance to farmers."

Davy possessed, in the highest degree, a candour and love of truth, which imparts to all his works the highest value. If he doubted the value of any of his own invaluable discoveries, he was certain to tell his readers his real opinion; if he found that he had made erroneous or inconclusive experiments, he anxiously confessed the fact. Thus, in the early part of this section, having formerly made use of certain fertilizers in too concentrated a state, he thus gives the detail of his errors (and I the more readily give the quotation, because, the error into which Davy was led is precisely that which, in many instances, I have seen imitated by very excellent farmers.) "I found by some experiments made in 1804 that plants introduced into strong fresh solutions of sugar, mucilage, tanning principle, jelly, and other substances, died; but that plants lived in the same solutions after they had fermented. At that time I supposed that fermentation was necessary to prepare the food of plants, but I have since found that the deleterious effect of the recent vegetable solutions was owing to their being too concentrated; in consequence of which the vegetable organs were probably clogged with solid matter, and the transpiration by the leaves prevented. In the beginning of June in the next year, I used solutions of the same substances, but so much diluted that there was only about one two-hundredth part of solid vegetable or animal matter in the solutions. Plants of mint grew luxuriantly in all these solutions, but least so in that of the astringent matter. I watered some spots of grass in a garden with the different solutions separately, and a spot with common water. The grass watered with solutions of jelly, sugar, and mucilage, grew most vigorously, and that watered with the solution of the tanning principle grew better than that watered with common water."

After briefly touching upon the chemical composition of various animal and vegetable principles, and explaining how the products of their decomposition serves as food for plants, he proceeds to touch upon the uses of almost all the commonly employed fertilizers in detail, for, as he very truly remarks, "as different manures contain different proportions of the elements necessary to vegetation, so they require a different treatment to enable them to produce their full effects in agriculture." He dwells first upon the value of green manures—rape-cake, malt-dust, sea-weed, &c.; then speaks of dry straw, woody-fibre, peat, wood, ashes, &c.; then treats of the animal manures, such as fish, blubber, bones, horns, hair, woollen-rags, feathers, blood, urine, the guano, nightsoil, dung of fowls, sheep, deer, rabbits, cattle, and examines the long mooted question of the state of putrefaction in which the dung of the farm-yard should be applied to the soil. In this very important examination, the experiments of Davy led him to the conclusion, that the dung of the farm-yard should be applied in as fresh a state as is consistent with the destruction of the seeds of weeds, and the attainment of a tolerable degree of neatness of tillage, for, as he remarks, "the excess of fermentation tends to the destruction and dissipation of the most useful part of the manure; and the ultimate results of this process are like those of combustion." The doctrine of the proper application of manures from organized substances, he adds in another place, "offers an illustration of an important part of the economy of nature, and of the happy order in which it is arranged. The death and decay of animal substances tend to resolve organized forms into chemical constituents; and the pernicious effluvia disengaged in the process seem to point out the propriety of burying them in the soil, where they are fitted to become the food of vegetables. The fermentation and putrefaction of organized substances in the free atmosphere are noxious processes, beneath the surface of the ground they are salutary operations. In this case the food of plants is prepared where it can be used; and that which would offend the senses and injure the health, if exposed, is converted by gradual processes into forms of beauty and usefulness; the fœtid gas is rendered a constituent of the aroma of the flower, and what might be poison becomes nourishment to animals and to man."

Having in the preceding chapter applied himself to the consideration of the organic manures, in his next or seventh lecture he commences the examination of those manures which are of mineral origin, their preparation, and the manner in which they act. The last chapter, indeed, might be said to treat of those fertilizers whose advantage to the soil is merely temporary. This lecture includes those whose action upon the fertility of the soil is permanent. This Davy felt was a more difficult research than the preceding, when he said, "The conversion of matter that has belonged to living structures into organized forms, is a process that can be easily understood; but it is more difficult to follow those operations by which earthy and saline matters are consolidated in the fibre of plants, and by which they are made subservient to their functions." "Some enquirers," he adds (and Davy seems ever to delight in alluding to such magnificent dreams), "adopting that sublime generalization of the ancient philosopher, that matter is the same in essence, and that the different substances considered as elements by chemists are merely different arrangements of the same indestructible particles, have endeavoured to prove that all the varieties of the principles found in plants may be formed from the substances in the atmosphere; and that vegetable life is a process in which bodies that the analytical philosopher is unable to change or to form, are constantly composed and decomposed."

In this section he examines with much care the action of lime, chalk, marl, gypsum, phosphate of lime, and other saline substances, assigning to each their probable value as fertilizers, and assisting the cultivator to a correct knowledge of the soils and plants to which they are severally the best adapted.

The eighth and concluding lecture of this excellent work is upon a variety of important questions, which could not be strictly included within the previous sections,—such as on the improvement of land by paring and burning; the chemistry of this operation, irrigation, fallowing, rotation, &c. He sums up the advantages and disadvantages of paring and burning land with his usual neatness,—"All soils that contain too much dead vegetable fibre, and which consequently lose from one-third to one-half of their weight by incineration, and all such as contain their earthy constituents in an impalpable state of division, that is, the stiff clays and marls, are improved by burning; but in coarse sands or rich soils containing a just mixture of the earths, and in all cases in which the texture is already sufficiently loose, or the organizable matter sufficiently soluble, the process of torrefaction cannot be useful." The chief advantage of irrigation, he thought, arose from the water preserving for the grass an equal degree of temperature. The advantages derived from fallowing he seemed to think had been overrated; but it is needless to particularize the many excellent observations with which the lecture abounds. Davy evidently felt, that he was laying a noble foundation on which succeeding chemists might enlarge, and from which future generations of intelligent farmers would reap the advantage. "I have now," he observed, "exhausted all the subjects of discussion which my experience or information has been able to supply on the connection of chemistry with agriculture. I venture to hope, that some of the views brought forward may contribute to the improvement of the most important and useful of the arts,—that the inquiry will be pursued by others, and that in proportion as chemical philosophy advances towards perfection, it will afford new aids to agriculture. There are sufficient motives connected both with pleasure and profit, to encourage ingenious men to pursue this new path of investigation: science cannot long be despised by any person as the mere speculation of theorists; but must soon be considered by all ranks of men in its true point of view, as the refinement of common sense, guided by experience, gradually substituting sound and rational principles for vague popular prejudices. The soil offers inexhaustible resources, which, when properly appreciated and employed, must increase our wealth, our population, and our physical strength. We possess advantages in the use of machinery and the division of labour belonging to no other nation. And the same energy of character, the same extent of resources which have always distinguished the people of the British islands, and made them excel in arms, commerce, letters, and philosophy, apply with the happiest effect to the cultivation of the earth. Nothing is impossible to labour, aided by ingenuity. The true objects of the agriculturist are likewise those of the patriot. Men value most what they have gained with effort; a just confidence in their own powers results from success,—they love their country better, because they have seen it improved by their own talents and industry, and they identify with their interests the existence of those institutions which have afforded them security, independence, and the multiplied enjoyments of civilized life."

The appendix to the Elements of Agricultural Chemistry is composed of the results of the copious, accurate, and elaborate experiments long carried on in the grass garden at Woburn Abbey, by the direction of John Duke of Bedford, under the direction of the late George Sinclair. Of this appendix it is hardly necessary to speak. It is the foundation on which George Sinclair afterwards produced his great work, the Hortus Gramineus Woburnensis, and should be more strictly included in the works of Sinclair than of Davy, whose chief merit in this instance was in the adoption of a mass of highly valuable practical information. In quitting Davy's Elements of Agricultural Chemistry, it is difficult to resist the conviction, that the volume is fraught with matter full of interest to the cultivator of the soil, resting on the most secure of all foundations, that of chemical science. More than a quarter of a century has now elapsed since this volume made its appearance, and still the work remains unexcelled by any similar production. It is yet the most clearly written, the most rational, and therefore the most popular, treatise on the chemistry of agriculture.

Passing over the merely chemical labours and discoveries of Davy, which have so well immortalized his name, we come to his work on Fly Fishing, which is entitled "Salmonia." This work was the offspring of his last excursions in search of health, when his end was approaching,—when he was suffering in his health from the effects of long continued and harassing chemical researches and other laborious efforts, not only in the laboratory of the Royal Institution, but carried on, and generally successfully, in the noble effort to serve the miner from destruction,—to unroll the Papyrus of Herculaneum for the service of literature, to shield the copper sheathings of the mariner from the effects of corrosion, and in other noble national objects, he told the readers of this excellent refreshing little volume, which is dated in September 1828, from Laybach in Illyria, that "these pages formed the occupation of the author during some months of severe and dangerous illness, when he was wholly incapable of attending to more useful studies, or of following more serious pursuits. They constituted his amusement in many hours which otherwise would have been unoccupied and tedious."

The love of Davy for angling appears to have bordered on enthusiasm. He seems, indeed, to have had a suspicion that he might be ridiculed for his love of this apparently rather trifling pursuit, and is careful therefore to shield himself from ridicule, by quoting the authority of other eminent persons who, like him, were devoted to this sport. Names, among others—Gay the poet; Tobin, the author of the Honey-Moon; Nelson, who even fished in the Wandle when he had only his left arm; and Dr Paley, who was so ardently attached to this amusement, that when the Bishop of Durham on one occasion inquired of him when one of his most important works would be finished, said, with great simplicity and good humour, "My Lord, I shall work steadily at it when the fly-fishing season is over," as if this were a business of his life. This defence of angling, as it commences, so it concludes, his Salmonia. Thus, the following is the last portion of the work, which is in the form of a dialogue carried on by a party of fishermen:—

"*Halieus.*—The most important principle, perhaps, in life, is to have a pursuit, a useful one if possible, and, at all events, an innocent one; and the scenes you have enjoyed, the contemplations to which they have led, and the exercise in which we have indulged, have, I am sure, been very salutary to the body, and I hope to the mind. I have always found a peculiar effect from this kind of life. It has appeared to bring me back to early times and feelings, and to create again the hopes and happiness of youthful days.

"*Physicus.*—I felt something like what you described; and, were I convinced that, in the cultivation of the amusement, these feelings would increase, I would devote myself to it with passion, but I fear in my case this is impossible. Ah, could I recover any thing like that freshness of mind which I possessed at twenty-five, and which, like the dew of the dawning morning, covered all objects and nourished all things that grew, and in which they were more beautiful, even than in mid-day sunshine, what would I not give! All that I have gained in an active and not unprofitable life. How well I remember that delightful season, when, full of power, I sought for power in others, and power was sympathy, and sympathy, power—when the dead, the unknown, the great of other ages and of distant places, were made, by the force of the imagination, my companions and friends—when every flower had the bloom and the perfume of the rose, and every spray or plant seemed either the poet's laurel or the civic oak, which appeared to offer themselves as wreaths to adorn my throbbing brow. But, alas, this cannot be; and even you cannot have *two springs* in life, though, I have no doubt, you have fishing days in which the feelings of youth return, and that your autumn has a more vernal character than mine.

"*Poites.*—I do not think Halieus had ever any season except a perpetual and gentle spring, for the tones of his mind have been always so quiet, it has been so little scorched by sunshine, and so little shaken by winds, that I think it may be compared to that sempivernal climate fabled of the Hesperides, where the same trees produced at once buds, leaves, blossoms, and fruits.

"*Halieus.*—Nay, my friends, spare me a little, spare my grey hairs. I have not, perhaps, abused my youth so much as some of my friends, but all things that you have known I have known; and, if I have not been so much scorched by the passions from which so many of my acquaintances have suffered, I owe it rather to the constant employment of a laborious profession, and to the exertions called for by the hopes, wants, and wishes of a rising family, than to any merits of my own, either moral or constitutional. For my health I may thank my ancestors, after my God, and I have not squandered what was so bountifully given; and though I do not expect, like our arch-patriarch Walton, to number ninety years and upwards, yet I hope, as long as I can enjoy in a vernal day the light and warmth of the sunbeams, still to haunt the streams, following the example of our late venerable friend Benjamin West, the President of the Royal Academy, in company with whom, when he was an octogenarian, I have thrown the fly, caught trout, and enjoyed a delightful day of angling and social amusement in the shady green meadows, by the bright clear streams of the Wandle."

In arising from the perusal of Davy's Salmonia, written as it is in so simple, so refreshing a manner, detailing facts, and describing scenery with which the great mass of readers have but little sympathy, the same reflection steals over us that presses upon every reader of Izaak Walton, viz., some degree of surprise that we can feel so interested on such a theme; and yet we follow on as if we understood and practised the art it describes, or were used to be cheered and invigorated by leading the harmless life of a fisherman.

The intense mental exertions of the subject of this memoir, however, combined with the effects of a long-continued application to chemical experiments, made even upon his own respiration with certain powerful, and even corrosive gases, began to tell, while he was yet in the prime of life, upon a constitution never remarkably robust. Repose became, therefore, absolutely necessary; and he finally left his own country, in search of quietude and health.

Davy affectingly alludes to this state of his existence, when he says, in his "Last Days of a Philosopher,"—"After passing a few months in England, and enjoying (as much as I could enjoy anything) the society of a few friends who still remained alive, the desire of travel again seized me. I had preserved, amidst the wreck of time, one feeling strong and unbroken, the love of natural scenery, and this in advanced life, formed a principal motive for my plans of conduct and action. Of all the climates of Europe, England seems to me most fitted for the activity of the mind, and the least suited to repose. The alternations of climate so various and rapid, continually awaken new sensations, and the changes in the sky from dryness to moisture, from the blue ethereal to cloudiness and fogs, seem to keep the nervous system in a constant state of disturbance. In the mild climate of Nice, Naples, or Sicily, where even in winter it is possible to enjoy the warmth of the sunshine in the open air beneath palm-trees, or amidst evergreen groves of orange-trees, covered with odorous fruit and sweet-scented leaves, mere existence is a pleasure, and even the pains of disease are sometimes forgotten amidst the balmy influence of nature. But in the changeful and tumultuous atmosphere of England, to be tranquil is a labour, and employment is necessary to ward off the attacks of ennui. The English, as a nation, is pre-eminently active, and the natives of no other country follow their objects with so much force, fire, and constancy. But as human powers are limited, there are few examples of very distinguished men living in this country to old age; they usually fail, droop, and die, before they have attained the period naturally marked for the end of human existence. The lives of our statesmen, warriors, poets, and even philosophers, offer abundant proofs of the truth of this opinion, whatever burns, consumes, ashes remain. Before the period of youth is passed, grey hairs usually cover those brows which are adorned with the civic oak or the laurel, and in the luxurious and exciting life of the man of pleasure, their tints are not even preserved by the myrtle wreath or the garland of roses from the premature winter of time."

This memoir, however, of the works of Davy (so far as they relate to rural life) must be now brought to a close. He continued to relieve his mind, and to endeavour to recruit his over-wrought frame, by travelling on the continent, and by visiting its most celebrated salmon and trout streams, from the Norwegian waters to the streams of Illyria. But he now became afflicted with a series of paralytic seizures which finally hurried him to his grave. It was in this state of body, but with a mind still unsubdued, that he beguiled away his hours of sickness and nervous excitement, by the production of the last of his published works, the beautiful little volume, entitled "Consolations in Travel, or the Last Days of a Philosopher." From the composition of this work, he tells us in the preface, dated from Rome in February 1829,—"He has derived some pleasure and some consolation, when most other sources of consolation and pleasure were closed to him, from this exercise of his mind, and he ventures to hope that these hours of sickness may be not altogether unprofitable to persons in perfect health."

It is, perhaps, by these two little excellent volumes, that Davy in after ages will be best known to the world at large, for they contain facts and beautifully expressed observations, which can scarcely ever cease to give instruction and pleasure. They, therefore, in all probability, will be referred to and read, when the progress of scientific discoveries shall have rendered less valuable to future ages his merely philosophical works. It is hardly necessary to select for the cultivator's perusal, any lengthened quotations from a work which ought to be so generally known as this to the rural life of our island. The accomplished agriculturist will, perhaps, see in the description by Davy of the chemist, and of the nobleness of his objects, additional reasons for devoting a portion of his time to the study of his highly interesting discoveries.

> "The true chemical philosopher sees good in all the diversified forms of the external world. Whilst he investigates the operations of infinite power, guided by infinite wisdom, all low prejudices, all mean superstitions, disappear from his mind. He seems an atom amidst atoms, fixed upon a point in space; and yet modifying the laws that are around him by understanding them, and gaining, as it were, a kind of dominion over time and an empire in material space, and exerting on a scale infinitely small, a power seeming a sort of shadow or reflection of creative energy, and which entitles him to the distinction of being made in the image of

God, and animated by a spark of the Divine mind. Whilst chemical pursuits exalt the understanding, they do not depress the imagination, or weaken genuine feeling; whilst they give the mind habits of accuracy by obliging it to attend to facts. They likewise extend its analogies, and though conversant with the minute form of things, they have for their ultimate end the great and magnificent objects of nature. They regard the formation of a crystal, the structure of a pebble, the nature of a clay or earth; and they apply to the causes of the diversity of our mountain chains, the appearances of the winds, thunder-storms, meteors, the earthquake, the volcano, and all those phenomena which offer the most striking images to the poet and the painter. They keep alive that inextinguishable thirst after knowledge which is one of the great characteristics of our nature—for every discovery opens a new field for investigation of facts, shews us the imperfection of our theories. It has been justly said that the greater the circle of light, the greater the boundary of darkness by which it is surrounded. This strictly applies to chemical enquiries, and hence they are wonderfully suited to the progressive nature of the human intellect, which, by its increasing efforts to acquire a higher kind of wisdom and a state in which truth is fully and brightly revealed, seems, as it were, to demonstrate its birthright to immortality."

Davy every now and then glances in his works at his own history, with all the quiet modest bearing of the true philosopher, who could not but feel that he had ardently and successfully served mankind in many a noble effort, and yet well knew that such claims to the gratitude of the world could not gracefully be even alluded to by him who so richly deserved them. For instance, he observes in one place, "To attempt to give you any idea of the formation of my character would lead me into the history of my youth, which almost approaches to a tale of romance. The source of the little information and intelligence I possess, I must refer to a restless activity of spirit, a love of glory which ever belonged to my infancy, and a sensibility easily excited, and not easily conquered. My parentage was humble; yet I can believe a traditional history of my paternal grandmother, that the origin of our family was from an old Norman stock. I formed this belief upon certain feelings which I can only refer to a hereditary source, a pride of decorum, a tact and refinement even in boyhood, and which are contradictory to the idea of an origin from a race of peasants. Accident opened to me in youth a philosophical career, which I pursued with success. In manhood fortune smiled upon me, and made me independent. I then really became a philosopher, and pursued my travels with the object of instructing myself, and of benefiting mankind. I have seen most parts of Europe, and conversed, I believe, with all the illustrious men of science belonging to them. My life has not been unlike that of the ancient Greek sages, I have added some little to the quantum of human knowledge, and I have endeavoured to add something to the quantum of human happiness. In my early life I was a sceptic, I have informed you how I became a believer, and I constantly bless the Supreme Intelligence for the favour of some gleams of divine light which have been vouchsafed to me in this our state of darkness and doubt."

These were almost the last words that Sir Humphrey Davy wrote for the press. He left Rome for Geneva, and on the 28th of May 1829, having travelled by easy stages, he arrived at that town. His brilliant course, however, was now run, for he died at his hotel on the night of that day. He had dined, it seems, according to the account given by Dr Paris, at four o'clock, ate heartily, was unusually cheerful, and joked with the waiter about the cookery of the fish, which he appeared particularly to admire, and he desired that, as long as he remained at the hotel, that he might be daily supplied with every possible variety that the Lake of Geneva afforded. Having drank tea at eleven, he retired to rest at twelve. His servant, who slept in a bed parallel to his own, in the same alcove, was, however, shortly called to attend him, when he desired that his brother, Dr John Davy, might be summoned, and on his entering the room, he told him that he was dying, and that it was his desire, when all was over, that no disturbance of any kind might be made in the house, but that the door should be locked, and every one retire quietly to his apartment. He died without a struggle, at a quarter before three o'clock. He was in the 51st year of his age.*

I have in this paper confined myself only to such of his works as directly relate to rural affairs; the following is the complete list of his published works :—1. Experimental Essays on Heat, Light, and on the Combinations of Light; with a new Theory of Respiration, &c. Published in contributions to Physical and Medical Knowledge, by Dr Beddoes, 1799. 2. Researches, Chemical and Philosophical, chiefly concerning Nitrous Oxide, and its respiration, 1800. 3. A Syllabus of a Course of Lectures. 4. An Introductory Lecture, 1801. 5. Elements of Chemical Philosophy, 1812. 6. Elements of Agricultural Chemistry, 1813. 7. On the Safety Lamp for

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* Sir Humphrey Davy married, in 1812, Mrs Apreece, the widow of S. A. Apreece, Esq., but by this lady, who was the daughter and heiress of C. Kerr, Esq. of Kelso, he had no issue.

Coal Miners, with some researches on Flame, 1818. 8. Salmonia, or Days of Fly-Fishing. 9. Consolations in Travel, or the Last Days of a Philosopher.

There are also numerous and valuable papers and lectures, read before the Royal Society (of which he was first the Secretary, and aftewards President), from June 1801 to November 1828. In one of these papers, read February 24. 1803, he enters minutely into the operation of tanning. It is entitled " An Account of some Experiments and Observations on the Constituent Parts of certain Astringent Vegetables, and on their Operation in Tanning." He had another paper read April 9. 1818, " On the Formation of Mists in certain situations." The other papers relate chiefly to his discoveries of the metallic bases of the alkalies, earths, &c., the nature of flame, explosive mixtures, &c. &c.

The death of Davy was lamented by all men of science, and by all those who felt the importance of combining "science with practice" in the better cultivation of the earth. For such men felt that a labourer had fallen in this noble field, who had well merited all the rewards which his contemporaries had so readily bestowed upon him. Davy indeed laboured to benefit his countrymen with an industry which seemed never exhausted, and with a sagacity never excelled, for in his discoveries chance yielded him but little assistance. He indeed felt very justly that chance had usually honours paid to it which it but rarely deserved, and it would be well if those who sometimes, from want of sufficient knowledge, ridicule the advantages of applying science to agriculture, were to read that portion of Davy's remarks, where he says, in his " Last Days of a Philosopher"—" I will readily allow that accident has had much to do with the origin of the arts as with the progress of the sciences. But it has been by scientific processes and experiments that these accidental results have been rendered really applicable to the purposes of common life. Besides, it requires a certain degree of knowledge and scientific combination to understand and seize upon the facts which have originated in accident. It is certain that in all fires, alkaline substances and sand are fused together, and clay hardened; yet for ages after this discovery glass and porcelain were unknown till some men of genius profited by a scientific combination, often observed, but never applied. It suits the indolence of those minds which never attempt any thing, and which, probably, if they did attempt any thing, would not succeed, to refer to accident that which belongs to genius. It is sometimes said by such persons that the law of gravitation was owing to accident, and a ridiculous story is told of the falling of an apple as the cause of this discovery. As well might the invention of fluxions or the architectural wonders of the dome of St Peter's, or the Apollo Belvidere, be supposed to be owing to accidental combinations. In the progress of an art, from its rudest to its more perfect state, the whole process depends upon experiments. Science in fact is nothing more than the refinement of common sense, making use of facts already known to acquire new facts. In modern times, the refining of sugar, the preparation of saltpetre, the manufacturing of acids, salts, &c. are all the result of pure chemistry. Take gunpowder as a specimen, no person but a man infinitely diversifying his processes, and guided by analogy, could have made such a discovery. Look into the books of the alchemists, and some idea may be formed of the results of experiments. It is true these persons were guided by false views, yet they made most useful researches, and Lord Bacon has justly compared them to the husbandmen who, searching for an imaginary treasure, fertilized the soil. In another department the use of the electrical conductor was a pure scientific combination, and the sublimity of the discovery of the American philosopher was only equalled by the happy application he immediately made of it. In our own times, it would be easy to point out numerous instances in which great improvements, and beneficial results connected with the comforts, the happiness, and even life, of our fellow-creatures, have been the results of scientific combinations; but I cannot do this without constituting myself a judge of the works of philosophers, who are still alive, whose researches are known, whose labours are respected, and who will receive from posterity praises that their contemporaries hardly dare bestow upon them."

Such nobly earned praises, thus modestly glanced at by Sir Humphry Davy, the modern farmer will be ever ready to award to the author of the "Elements of Agricultural Chemistry." For Davy not only is entitled to the grateful remembrance of the agriculturist for the laborious course of investigation which he instituted, and for the immediate fruits of those invaluable researches, but for the many indirect benefits flowing very naturally from so noble, so successful, an effort. Thus Davy taught his contemporary farmers, and he taught them wisely too, that the resources of science are as inexhaustible as the productions of nature—that one advance being made, one step achieved, was only the prelude to still greater discoveries, to more certain practice, to better understood and more perfect modes of tillage. The powerful mpression he thus made upon the mass of indolence, of apathy and prejudice, which once existed, and retarded the advancement of agricultural improvements, was felt not only in his own time, but is now felt, and will continue to be experienced by many after generations of successful cultivators of the soil. For it was very speedily and generally seen after the publication of his book, that chemistry brought in fact to the cultivator's aid, not the dreams of the alchemist, farming only over his alembics and crucibles, but the cool, quiet discoveries and reasonings of such men as Hales, Priestley, Knight, and Davy, who experimentalized also in the gardens, the woods, and the fields—not only upon the dead, but on the living plant. Men who, to a profound knowledge of the magic science of chemistry, united a caution never excelled, and a vigilance ever exerted to observe and record every fact which might tend to advance the great object of their researches, the most profitable practice of the science of agriculture.

THE AGRICULTURIST'S NOTE-BOOK.—NO. XX.

The sheep shall then on thymy pastures stray,
And shepherds dance at summer's opening day;
Each wandering genius of the lonely glen,
Shall start to see the glittering haunts of men;
And silence watch on woodland heights around,
The village vesper as it tolls profound.

Artificial Shelter for Sheep.—By Mr William Hogg, Stobohope, Peeblesshire.—The want of shelter for sheep during winter storms and snow-drifts, is every year becoming more evident, and erections of one kind or other are supremely necessary, if we attend to the following circumstances. Within the last half century, the alteration of the soil by burning and otherways exterminating the old deep heath, has so bared the hills of natural shelter, that sheep are now driven athwart the naked slopes before the blasts of sleet, and the naked surface can give no protection from snow-drift. Again, a more delicate breed has now appeared among the glens; they have brought their dispositions and diseases along with them; both these demand protection and care far beyond what the old healthy independent race required. The loss during winter among the old breed was said to be immense, but their management was unskilful and their treatment rude. Of itself, however, it was a hardy healthy animal; it feared not the fiercest blasts. On many farms it sought and knew of no other protection than the friendly heath; cowering through night beneath its thick-tufted tops, it rose fresh and vigorous in the morning, took two or three bites from the lateral branches which formed its bed, then withdrew through the day to where the air was not so piercingly cold, and where the meat was more plenty and more nutritious. Not so, however, with that breed which now occupies these pastures where that hardy race once throve and prospered. By complete domestication and constant attendance, their native instincts are blunted, in some flocks nearly obliterated; they have resigned themselves to the shepherd's care; they wait for his help through day to guide and excite them to meat, and must have artificial protection through night. They make small exertions for their own safety, and though the danger were ever so imminent, they seem unconscious and unconcerned. So it is with many of the sheep flocks at this time, and so it ever will be with all the domestic tribes of animals, where man interferes too much with their propagation; for if human design is clearly discernible in the form and proportions of a breed, it naturally leans to human help in all its difficulties. Thus, when the nakedness of the hills are taken into consideration with the unconfirmed abilities of sundry stocks that have not yet got free of a mixture of bloods, together with the delicacy of all that have, or are changing, it is evident that protection from snow-drifts, both of a better form and far more general than what they are, is absolutely necessary.

You can hardly travel along the wildest of our sheep-glens, but you meet with erections of some form or other that have long since crumbled even with the soil; the breadth of the dyke, with the abundant layer of fog and lichens which enwrap the stones, give evidence that they have been raised, and have even fallen to ruins at a very remote period. Perhaps their erection had been coeval with the introduction of sheep to the glen, but their site and form prove that the man at whose instance they were built, had a very mistaken conception of the force and action of snow-drift, or that its fury was stronger in one part of the pasture than another; and indeed, the abundance of stones in the neighbourhood in sundry places, seem to have been the principal inducement in the choice of a situation. They are often found in the form of an elongated C, and sometimes of a capital I. Such figures might give shelter from storms of sleet or rain, which are immediately absorbed by the earth or run off the surface into some hollow; but against a snow-drift they could be no protection, for every flake which then falls is a permanent addition to that immense profusion which fills and darkens the air, or drifts along the surface. Besides, it must be understood, that every figure, whether natural or artificial, which opposes the drift at right angles, only increases the fury of the storm, and soon collects a wreath of the same depth with its own height, when the shelter with all its contents are buried beneath the drifted heap. Since the writer's recollection, figures of another form were raised as winter protection for sheep. They were in the form of two roman C's, joined thus)(. To look on this figure on paper, or as an erection on the ground, one would think that in some of its recesses protection might be found from every point from which the wind could blow; but the motion and activity of snow-drift round any object cannot be exactly foretold even by the most experienced, for the facility with which a small or distant object turns it aside often in a contrary course to the general current of the storm is surprising; hence its various directions, depths, and quantities, in any given place, defy all calculation, till such time as the drift subsides. Yet it is quite obvious, that in one of the above recesses, a shelter will be found from every point from which snow-drift can blow, while the other directly opposite must comprehend within its arms, and compress into less space, the whole fury of the storm. Meeting with such sudden and direct opposition, the general current of drift and wind which had hitherto swept over the surface in an unbroken stream, is now forced into innumerable eddies, which wheel and boil over the top of the shelter, and then again borne down by the motion and pressure of higher strata of wind and drift, so that in fact little shelter is left where the principal shelter should be. But what has suppressed, and I hope ever will prevent, the erection of such figures, is, that they are no protection from a turning wind; if this should vary but a single point in the night-time, the creatures availing themselves of such protection are miserable. Sundry instances have occurred, in which part of them have been utterly destroyed.

To prevent misfortunes arising from a turning wind, and to have protection from every point, and this protection open and available at all times, a perfect circle has recently been invented; this has been found sufficient, and, I may say (if put in a right situation), in all cases safe. This figure, by presenting an obtuse point to the storm, separates the masses of drift as they come forward; part of which sweeps round the curved figure on each side, part rises over the dyke, and is carried by the force of the wind over the enclosed space, where meeting with that proportion which makes the sweep of the enclosure, it is all stored up in a triangular wreath on the lee side of the stell.

An erection of this form is the best that has yet been raised for mountain-sheep. It has also the following advantages:—it can be built at a small expense, almost in any situation, and it is safe in the darkest drifts I have yet seen. It is obvious, the lesser the circle is, the smaller will be that portion of the circle at right angles with the blast, consequently, the closer will be the shelter inside; but when a round exceeds 17 or 18 yards in diameter, that section of the dyke farthest from the blast is apt to catch the lower edge of the drift as it passes over. This extent will accommodate ten scores of sheep, and a system of hay-racks within for fodder; if judiciously set up, the above number may all feed without much interruption from one another. If the night be very frosty and drifty, I would not hesitate to put in 17 or 18 scores; this is, however, too many for a night of ordinary temperature, neither can such a number be accommodated with fodder inside. Where an apparatus for foddering is to be erected inside, some prefer an octangular, septangular, or heptagonal figure: these forms admit of hay-racks being set up with great accuracy; but the many corners render the dyke not so durable; and it often happens that the drift meets one of the sections of the dyke at right angles, when the shelter within is not so good. Any of the figures mentioned will answer; still I would prefer a perfect circle, as in all cases best.

Hitherto I have been considering naked rounds, and if their situation is rightly chosen, they are sufficient for the safety of sheep; yet when a small belt of firs is put round them, sheep in them during a snow-drift are not only safe but happy; and when the animal is comfortably lodged through night, it sets out next morning with far brisker spirits to begin its day's work among the snow; less meat is also necessary to continue flesh and animation.

For a belt the Scottish fir is good, but the spruce is better; they protrude and perpetuate branches to the root,—wears their foliage all the year, effectually excluding the entrance of drift. The larch is not so good; they resign their leaves during winter,—has nothing to resist the blast nor absorb snow-drift, but small straight branches and a naked trunk; and if the belt is of this wood, it will require to be 60 or 70 paces wide; and when of this breadth, it will admit of being thinned to the distance that will permit the trees to come to their full maturity, and yet be sufficient shelter; but the third of this width is sufficient, if the spruce is taken. It is needless to remark, that, in planting a belt, there should be no thin, far less empty spaces; each tree should have room to spread its branches, rise to maturity, and put forth its leaves; and as spots in hilly districts are remarkable for a strong vigorous soil, having never been opened nor exhausted by artificial crops, the trees shoot rapidly up, insert their branches among one another, thus forming a defence altogether impenetrable to snow-drift; no snow falling within the round but what would rest within the same space, suppose the wind were perfectly quiet; indeed, it falls so softly, easily, quietly, and loosely, that sheep rise in the morning, shake the snow from their backs and sides, and thus clear themselves of the encumbrance in less than a quarter of a minute. If I were to say that a round, surrounded with the spruce fir, had any defect, it would be, that it was too warm for the temperature of the night, when next day was cold and drifty; sheep shrink from, and drive before the blast, and are unable to stand and make a sufficient day's work. I have often seen them hastily flee from cold and drift, when I thought they might have resisted both with greater bravery; but whether this was owing to a superior temperature through night, and all at once set within the action of a nipping frosty winter's wind, or to a disturbance in the animal spirits at the commencement, or during the continuance of severe weather, I could never ascertain. One thing I am certain of, I have seen sheep that were ill-sheltered through night, or that had by accident been exposed to the fury of a snow-storm (for the most prudent among the shepherds are sometimes mistaken), so benumbed and stiff with cold, that next day they could do nothing but stand and shiver, till the icy envelop melted from about them.

Sundry stocks of sheep derive a hardiness and animation from the genuine qualities of the soil on which they are bred, but "the bravest of the brave" must inevitably sink beneath the horrors of a winter's snow-drift, if in an ungathered state. What a fearful havoc did the 24th of January 1794 make among the sheep stocks on the south of Scotland! The previous night snow was on the ground about 4 or 5 inches deep, the wind was S.W., and it promised fair for freshness; already was the snow melting, and sprat and rushes which appeared above the snow were dripping with wet, and from their tops were falling lumps of half-melted snow. About midnight the wind declined towards S., and the fall of snow was heavy beyond all former precedent. The writer of this short narrative was in a lone desolate part of the mountains, and he felt the snow as it fell as it had been a weight on his shoulders, head, &c., and the desert place seemed to sigh with the extraordinary snow which fell upon it. At this time there was not an air of wind, only a chillness from the S., sufficient only to give the flakes, which then fell, a northerly direction. The wind, however, began to spring from between S. and S.E., and passing through SE.E. and N.E., about daylight it was veering for N. About nine next morning it was due N., when the horrid cloud opened and the sun shone out: I was glad, and I ought to have been thankful when I once more saw and felt his cheering beams; but such a scene! The poor creatures lay huddled together dead in dozens, scores, and hundreds above the snow; the extraordinary severity of frost and strength of wind had reached their vitals, I think, in a few minutes after foundering down with cold; many were also smothered deep at the bottom of immense wreaths, and were not found till the thaw came. This, indeed, was not long in coming, the snow lying only eight days; there was scarcely a pastoral district where there was not some human creature perished and many sheep. It must here be remarked, that this immense loss of sheep was principally occasioned by the flocks being in an ungathered state the night before. Slender and insufficient as the artificial shelter was at that time (and, indeed, it is not much better yet), had the flocks been collected about them, the loss could not have been so great. After such fearful destruction of our harmless creatures, one would have thought that protection, safe and sufficient, would have been immediately set up; and that, for poor unoffending animals, whose life at the best is generally a life of suffering, if their owners did it not for this, they would for their own secular advantage. The years following, great exertions were made to replace the numbers cut off by this hurricane; lambs rose as well as other ages of sheep; indeed they have never been so low since; yet, notwithstanding the increasing value of the animal, very little has been done either for particular or general protection. Breeds have been changed, and hill-pasture has been ameliorated by draining, but very little additional protection has been prepared.

In my opinion, one principal hinderance to the erection of proper winter-shelter for hill-sheep is, neither landlord nor tenant are fully aware of the hunger, fatigue, cold, and other privations which sheep-stock have to suffer during a severe and protracted winter. It is one thing to see a real distress, and quite another only to hear tell of it at a distance. The tenant is principally taken up with the business of the home-farm, the concerns of which press daily upon his observation, and at every review his home-affairs seem to call for closer attention, and the remonstrances and complaints of the shepherd for his poor suffering charge are too often disregarded, or at least quite undervalued.

A round should be situate on that department of a farm where the sheep most easily congregate in times of difficulty. Its particular site should be apart from rocks, steep or abrupt precipices. Such obstacles to the tempest only redouble its fury, and at uncertain intervals throw the regular current of the wind and drift into furious rushes, almost in every direction. If it be possible it should be placed where the general stream of wind is not obstructed nor hurried by any object on the earth's surface, but where it blows constantly, open, and free.

Since the introduction of the softer breeds to many of the Scottish pastures, storm-feeding has become a distinct and necessary business, at least on all the farms which lie along the small rivulets which draw their waters from the head-lands of the country. No kind of fodder is equal to hay, and hay made from the natural grasses of the farm on which the sheep pasture is the most wholesome. If meadow-hay, or hay made from sown grasses, are used, sheep will eat of these a greater quantity, and will do well enough; but on no kind of fodder will they prosper better than on that made from the common sprat and its congenite crops, taken from the roughest parts of their own pasture. Its principal excellency is its being well made; I mean its juices neither exhausted by too long an exposure to the atmosphere, nor soured and otherwise injured by an admission of external damp. Its natural sap should all be absorbed by the fibrous part of the grass, and when secured in this state it is almost as nutritious as when full of juice. It is eaten by the animal from the soil itself, and to obtain hay in this state, whatever is designed for storm-feeding, should be cut by the beginning of August. The juices of the grass are then most abundant; none of them are expended in the preparation and formation of seed: the days are generally then more unclouded and warm, the nights shorter, and the dews not so copious and cold. All these considerations should accelerate the making of sheep-hay; besides, when taken early, it allows a late foggage to rise, though on this there can be little dependence for winter, yet it is somewhat better than baring the surface with the scythe after Lammas, which is too often the case.

The methods of foddering sheep are various—some adhering to one plan, some another; but mountain-sheep, which are only foddered occasionally, or during a winter-storm, eat hay better when presented to them on the ground, that is, laid in handfuls among the snow, than offered to them from the rack. Yet a system of hay-racks inside the ground is available in all kinds of weather, boisterous as well as calm, with this additional advantage—they can have recourse to the rack through night, where they find it still clean and unsoiled. When distributed in handfuls over the snow, what is not eaten up on their first admission, is densely polluted with their dung, feet, &c., which is a great hinderance to them taking any more of it, unless very hungry. Besides, they can be foddered from the rack in a boisterous night, when, if laid upon snow, the wind will often sweep it all off in a minute.

When the storm is very severe, there is a necessity of foddering twice a-day, viz., evening and morning. This, if the stock is numerous, causes a rapid consumpt of fodder. A windling for each score was the old allowance, and I think at this day this is not far from the right quantity ; but the quantity given should be proportioned to the degree of hunger which the shepherd knows to prevail among them. Yet storm-feeding is a necessary evil ; sheep indulged with it one season, if they feel themselves in straitened circumstances, will not forget it a second : they expect it, weary for it, and near night give up all exertions for more meat. They wait and watch for it, and, spite of the shepherd's most prudent measures to continue their work, they leave the hills, congregate round the place they had formerly been accommodated with it ; still, during hard and heavy snows, there is no chance of saving life but by having recourse to it.

Storm-feeding with turnips is altogether inapplicable to mountain-sheep. Let us rationally consider the case, and its impracticability will be evident. It is the head-lands of any pastoral district which first suffers. These mountainous parts are laid out in large farms holding numerous flocks of sheep ;

these might no doubt be taken to where turnips are, but what an expense would it be to support only 50 scores for 24 hours! And on such places as we are alluding to, I have known a heavy storm lie on them for five weeks, and sometimes more, before effectual relief came; but, laying aside all considerations of expense, I do not think it would be advisable to apply to turnips a numerous stock, bred on high, heathy, coarse benty grasses, where bowels are naturally costive through winter. The laxative qualities of this root could not miss to open their bowels at this improper time, when very likely a part of winter, comprehending many a sharp frosty night, was yet to come; and I am certain, if the turnips was completely purgative, the consequences would be deadly. This last thought is, however, conjectural, having never seen turnips employed for storm-feeding; but a case not unsimilar to it came once under my observation. During a heavy long snow in 1795, a flock of 30 scores was completely stormed. One-half (15 scores) was taken to a low pasture in Annandale; the other half was fed with hay at home, brought from a considerable distance. The storm had lain a month before, but after the separation of the hirsel it lay only about ten days. When the snow came, the flock was rejoined on its native pasture, and every one thought the fodder-fed ones had lost least strength and animation; after, however, when they got their belly full of grass, a diarrhœa broke out among them, and carried off a good number. Sundry who did not die of the disease itself, were carried off by poverty early in spring. Since I saw the fatal results of storm-feeding at that time, I have considered it a matter of essential importance to offer sheep food of sound and wholesome qualities. We came afterwards to know that the hay had been taken from a meadow which was kept in strength and activity by a layer of cow's dung spread on the surface every season, the farmer having no other use for it. Indeed, when in a hungered and exhausted state, sheep will eat any thing which appears above snow. I have often seen them peeling the dry sapless fog from the face of the rocks, and eating it with great satisfaction.

Thus far have I written from experience—experience, I may say, at all times unpleasant, often severe, and not unfrequently hazardous, both to myself and the creatures of which I had charge; but the more trying the circumstances which I found myself and them in, the more strictly was I constrained to attend to the consequences, and every minute detail connected with snow-drift and storm-feeding.

*Model-Mapping.**—Agriculture is undoubtedly one of the most important branches of practical knowledge that ever engaged the attention of this or any other country, and the great interest now generally manifested in its extension and improvement has justly called in to its aid every subsidiary branch of science calculated to accelerate its progress and insure its success.

Nothing can give a more clear and distinct idea of the operations required for advantageous drainage than an accurate map or model of the ground, submitted officially to the consideration of a practical land-drainer. From a work of this kind his practised eye can at once detect the most advantageous direction that ought to be given to his lines, whether for effectually drying the moist soil, or irrigating the dry, or what combinations of both these operations may be most conducive to the general improvement of the property relative to which his opinion may have been desired.

Those who have visited the model of the field on which the memorable battle of Waterloo was fought, will readily appreciate the great superiority of a model over a plan in giving accuracy and precision to the true conception of every point of interest in that celebrated locality. Captain Siborn, the constructor of that model, if we mistake not, is also the author of a work on topographical surveying and modelling, which, in this particular case, he has so well illustrated practically.

When an inquiry was made at the commencement of the Ordnance Survey of Ireland relative to modelling, it was remarked that a " model, on a scale of four inches to a mile, of Great Britain and Ireland, and their numerous isles, their long broken indented outline of coast, the lofty extensive ranges of mountains in Wales, Scotland, Ireland, and the islands, would give a character and expression to this work of art which could not be surpassed. " No doubt," says one of the gentlemen examined on this subject, " it would be the most perfect system of representation you could obtain, but it would be *prodigiously expensive*."

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* Outline of a Method of Model-Mapping, &c., by J. Bailey Denton, surveyor. London, Weale 1841.

The same objection was urged by others. The expense, therefore, appears to have been the sole cause of the rejection of a *general* system of modelling. In some instances, however, it was practised; and a beautiful model of the Menai Straits, accompanied with an engraving by the angylyptograph, was, a few years ago, presented to the Royal Scottish Society of Arts by Captain A. Henderson, R.E., who had been long attached to the Ordnance Survey. This specimen may be consulted in the Society's Museum in Edinburgh by any gentleman taking an interest in topographical modelling.

At that period, the expense then appeared to be an insuperable objection to a general system of modelling. According to Mr Denton's views, however, page 20 of the pamphlet now under our notice, " a model of the average of the estates in England may be made at a cost of from 2s. 6d. to 3s. 6d. per acre, a sum little exceeding the charge for the production of a finished map formerly." He even thinks they may eventually be constructed at a cheaper rate than this. If that can be accomplished, every nobleman and country gentleman ought undoubtedly to possess such a model of his property, as an indispensable accompaniment to a well finished plan.

Every one wishing information on this subject should consult our author's pamphlet of about 36 pages, where, for its size and price, a great deal of useful matter may be found highly interesting to the county gentleman and practical surveyor.

The instruments described (perhaps we should say invented) by Mr Denton, are both ingenious and useful. He will forgive us for suggesting, as we think, one improvement upon his level B, Plate II. It is this: in future let, in addition to, and beside the arc cut in *degrees*, another arc be engraved, shewing, by the plumb-line, the *rise or fall of one foot in one hundred feet of distance*, in a manner similar to the lines frequently cut on the vertical arc of the theodolite for reducing inclined lines to the horizontal measure. By its means country gentlemen, farmers, and land-drainers, would avoid, by a simple process, the trigonometrical operation on page 35, to which we believe they have no great predilection.

On the whole, we approve of Mr Denton's suggestions, and beg to call the attention of those interested in the prosperity of agriculture to the merits of his little tract for the valuable hints which it contains.

*Falconry.**—How singular are the revolutions that take place in the progress of society in matters depending chiefly on taste, and how strikingly is this truism exemplified in the history of falconry! From having been considered one of the noblest occupations in which a man could engage, the chief field-sport, for centuries, of the middle and higher classes throughout Europe and Asia, its practice forming a science, and its language a dictionary, almost influencing the character, modes of thought, and expression, of entire nations, it has fallen not merely into desuetude, but almost into absolute oblivion. The few solitary instances in which it is yet cultivated, are just sufficient to keep the art from being entirely lost; its revival *on a large scale* as an interesting pastime seems never to be thought of. How few of the present day, comparatively speaking, have ever seen a hawk in its hood and bells, or any other of the multifarious appendages by which it was prepared for the chase! The whole mysteries of breeding and training, which, in the palmy days of falconry, even kings themselves did not disdain to study; the whole appurtenances and picturesque accessories of a pursuit which seems to combine all the elements of a healthful, elegant, and most exciting field-sport, have long since become almost to every one, matters of mere history in which they have no practical concern.

It is easy to perceive reasons for the decline of this ancient art, but it is difficult, we think, to account for its having made so near an approach to extinction. In fact, it was at one time carried to such an absurd height, the value set on hawks was so enormous, and the laws for protecting and regulating the sport were so oppressive and restrictive of the liberty of the subject, that such a state of things could not last; a certain falling off became inevitable. In process of time, when intellectual pursuits began to pervade society, continuing their onward and extending course till they had almost driven from the field that unflinching patron of all country sports, the "old country gentleman," falconry shared in the diminished attention which was necessarily paid to all rural recreations. When other wants, thus generated, came to be supplied, the expense attending falconry on the magnificent scale in which it was usually practised, would doubtless operate with many as a serious objection to it. But it appears to us obvious, notwithstanding what is alleged to the contrary, that the decline and fall of the art is chiefly to be ascribed to the use of the fowling-piece. As a ready means of getting possession of game, shooting admits of comparison with no other; and if hawking has any pretence to a preference, it can only be on the score of it being calculated to yield greater pleasure. On this ground, indeed, its merits must be admitted to stand high. The graceful and agile movements of the hawk in the air, now soaring over the heads of the sportsmen, now mounting

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* A Treatise upon Falconry. In two parts. By James Cockburn Bellany. Berwick upon Tweed, 1841.

> —— up, and up, and up,
> In spiry rings, piercing the firmament,
> Till he o'ertops his prey, then gives the stoop
> More fleet and sure than ever arrow sped!—

the instincts displayed both by him and the hapless object of his pursuit—the gay groups of equestrians of both sexes—the panorama of a beautiful landscape—the fine weather which is necessary for successfully prosecuting the sport—from a combination of agreeable influences which no one can look on with indifference, and which are the more gratifying because they can be shared by many at once. All this, however, is a matter of too much pomp and circumstance to be every day, or even frequently enjoyed. But even a pedestrian sportsman with one or two attendants has many of the pleasures of hawking easily within his reach. It can hardly be doubted, however, that the advocates of hawking, when comparing it with shooting as a source of amusement, have greatly underrated the interest that belongs to the latter. It may fairly be assumed that it is no slight attraction that leads the fowler over moor and dale with undiminished perseverance, day after day, from morn till dewy eve; and that in most cases with little or no regard to the intrinsic value of the produce of his exertions. Indeed, the interest is of the very strongest kind, and amounts in some cases to a kind of fascination. The love of fire-arms shews itself at an early period, nearly in all boys who have an opportunity of becoming acquainted with them; and instances are daily before our eyes of the enthusiasm with which the sport of shooting is prosecuted by adults. We have never seen an attempt made to analyze the causes of the pleasure it affords; but they must mainly, we think, be resolvable into the love of power, and the gratification arising from the exercise of skill. Armed with his formidable instrument, the shooter walks abroad as monarch of all he surveys in living nature. The power of life and death is placed in his hands. He obtains direct "dominion over the beasts of the fields, and over the fowl of the air." No swiftness can outstrip, no vigilance elude, no strength withstand him. Regulated by his skill, the force he can employ operates like a kind of enchantment, so instantaneous and awfully decisive its effects. Were we attempting a complete analysis of the pleasure of shooting, other circumstances would be alluded to as entering as elements into its formation, such as the uncertainty of the moment when he is to fall in with his game, by which the sportsman's attention is ever kept on the stretch, and he is drawn forward with undiminished interest; but enough has been said to shew that the sport addresses itself to some of the strongest appetencies of our nature, and yields a high degree of pleasure, and as such, in connection with its indisputable superiority to every other in efficiency and economy, it could not fail to supersede hawking, and must always prevent it in time to come from regaining its former ascendancy.

But all this leaves room for surprise, as well as regret, that the latter is so nearly abolished. It is in itself a pursuit full of interest, and, as a most pleasing memorial of the "days of other years," is well worthy of revival. The same neglect has not fallen to the lot of any other important or national pastime of the olden time, at all resembling it in character. Take archery as an example; from having been an object of national importance, it has long ceased to be of any practical value, but how zealously is it still upheld as an agreeable recreation! Almost every county has its toxophilist associations, and private practising in the art is frequent with both sexes. This, and some other similar field-sports, have the advantage, it is true, of being very easily attainable, but it is a mistake to suppose that hawking is necessarily attended either with much trouble or expense. It may, indeed, be followed in such a way as to entail great expenditure. Lord Oxford spent a hundred pounds per annum on each of the many hawks he kept, and he likewise had a falconer for each bird; but this was an abuse which is not likely to be imitated. It is agreed among falconers, that hawks can have no better food than beef, with an occasional pigeon, fowl, or quarry; when out hawking, none of them ought to have more than from three to four ounces within the twenty-four hours. By a slight computation of the current price of beef, and the quantity consumed at this rate, a tolerable estimate may be formed of the yearly expense for the maintenance of one of these birds. Two active falconers are quite capable of managing a good flight of hawks, either in the field or in the mews. Indeed, where the owner himself takes an active interest in training and flying his hawks, a single assistant in ordinary cases, that is, where a *few casts* are kept, will be found sufficient.*

Of those who have recently taken an interest in the revival of this delightful sport, the following are the principal that have come to our knowledge:—The Duke of St Alban's, who as is well known, is *Grand Faucounier* to the crown, and has a yearly salary for keeping the royal hawks; Lord Oxford, Sir John Sebright, J. D. Downes, Esq., Colonel Thornton,

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* Belany's Treatise on Falconry, p. 75-6.

Captain Bonum, Mr Sinclaire (Ireland), and Mr Belany of Berwick.

The last named gentleman has published the interesting work on Falconry, the title of which has been given above. A warm admirer of the sport, and anxious for its revival, he has endeavoured to make the intrinsic merits of falconry better understood than they are in this country, and to preserve the essentials of the art from being utterly lost. His work derives its value from being the result of a practical knowledge of the subject, and not compiled from the unintelligible gleanings or absurd theories, of which the majority both of ancient and modern publications consist. At the late meeting of the Highland and Agricultural Society at Berwick, Mr Belany intended to gratify the members by shewing the flight of his hawks, but the state of the weather prevented an exhibition which might have led some of the country gentlemen (the natural patrons of genuine field-sports) then assembled, to take an interest in the restoration of falconry, and endeavour to practise it themselves. To enable them to do this, Mr Belany's work will be found to contain nearly all the requisite information, and its perusal will probably communicate some degree of that enthusiasm for the art with which he is himself animated.

All the birds in most repute for hawking are natives of this country, and one of the most celebrated, the Peregrine falcon, is by no means rare. The places most distinguished in former times for producing bold and generous specimens of this bird, were Hambleton in Yorkshire, for a breed used to fly at wild ducks; Llandidno in Wales, Dumbarton, and the Bass in Scotland. The Jerfalcon, however, of still greater celebrity, is only a casual visitant to this country; but trained examples are frequently brought to Britain for sale, from Norway and Iceland. The true falcons of Britain (genus *Falco*) are only six in number, but the different kinds of hawks are numerous. The increased cultivation of the country, and the relentless war carried on against them by gamekeepers and others, have no doubt greatly diminished the number of our accipitrine birds, but the sportsman would still find no difficulty in obtaining an ample supply. One of the most attractive departments of hawking is the opportunity it affords of observing the dispositions and habits of this noble race of birds.

> How nature fashioned them for their bold trade!
> Gave them their stars of eyes to range abroad,
> Their wings of glorious spread to mow the air,
> And breast of might to use them.

Yet with all this fierceness of disposition, boldness, and courage, how perfectly docile and submissive they become, under proper management, and not only so, but even at times exhibit the greatest attachment to their master. This is shewn in such an interesting manner in the account given by Mr Belany of one of his favourite hawks, that, although of some length, we cannot refrain from quoting it.

"I myself have had hawks which have exhibited as strong signs of attachment to me as ever dog did to its master. One falcon in particular,* which travelled with me upwards of two thousand miles, became so very fond of my company, that she would scarcely sit at rest but in my presence. A delicate state of health having induced me to seek the benefits of a change of air and scenery in an excursion through a few of the different counties of the south of England, I, instead of taking with me the usual companion of the wanderer, a dog, took a falcon upon my fist. A gentleman joined at London for the tour. To recount half the instances illustrative of the truth of this argument with which the adventure was fraught, or which might seem entertaining to those interested in the character of this genus of birds, would doubtless appear foreign to the present subject, and would require a volume for themselves. A few brief observations, however, to readers in general, may not prove unacceptable.

"The falcon approved herself not only an affectionate and faithful, but a most enchanting companion. She had not only such influence as to procure us free access to many of the preserves of the squires and knights that lay in our route, where, among partridges and pheasants, she astonished their proprietors; but also the power of acting as a magical passport to the smiles and graces of their fair families; thus affording us opportunities of experiencing the hospitality of their rural mansions. She was a general favourite wherever we went, not less with the ladies than with the gentlemen; and at every inn or village in which for a few days we beat up quarters, she seldom failed to gain for us

Passing favours and most matchless friends.

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* We wish the author had mentioned of what species.—EDITOR.

"The enjoyments she afforded us were often as diversified as the landscapes we travelled through; and the strange contrasts of character which she had the virtue of bringing around her, never failed to yield new interest and amusement to her fellow travellers. At one time we beheld her surrounded by "high aristocrats and ladies fair;" at another encompassed by a regiment of ragamuffin boys and girls, who often did us the uncalled-for honour to escort us through the streets and villages as we passed along, despite many modest and heartfelt expressions from my friend declining all such marks of public esteem, which he declared to be quite unmerited on our part, and due only to a band of blind fiddlers. One day we beheld her basking in the smiles and graces of a fine lady—the next outdone by the overwhelming encomiums of a drunken landlord.

"During the whole of our travels, whether by steam-boats, stage-coaches, post-chaises, gigs, omnibuses, vans, on foot or on horseback, she sat upon my hand, and wherever we stayed, whether in public or private house, her perch under night was in my bed-room; and during the day, except when out of doors upon a block, always in the same apartment with her companions. Thus accustomed to be in my company, her attachment became so strong that she appeared always restless and dissatisfied when not beside me; or, as a lady once observed, 'she never seemed pleased but in the presence of her lord.' After an excursion of from four to five months' duration, we returned to London, where she died shortly afterwards, but not before she had delighted many of her metropolitan admirers by a few beautiful flights at pigeons. Her death was caused by too close confinement in the city having brought on a disease of the stomach.

"Being in private lodgings, where none but the servants of the family and my own friends were in the habit of entering, she became so 'perfectly at home' that she would sometimes walk out of one room into another in search of me; would follow me from one apartment to another, and come from the most distant part of the house even in the dark, or with the hood on, when I chose to call her. This she has done often in the presence of my friends. If I happened to sleep past my usual rising hours, she would leave her block (which stood in a corner of the room with a piece of canvass spread around it to prevent her mutes from soiling the carpet) fly into the bed and take me gently by the ear; or if I happened to be absent for any length of time, or had been late in coming in at night, she, being accustomed to see me much at home, and likewise to be regularly spoken to and stroked gently on the breast before I retired to rest, would come off her block, wander round the room, and, finding the door shut, take a place close by the threshold, and there wait patiently till my return. Nor could the inmates induce her to return to the block. As soon, however, as I entered, she would fly to my arm, get upon my shoulder, rub her beak against my cheek, shewing every token of welcome and gladness at my return. For about a week previous to her death, she refused to take any food, and for the last three or four nights she had regularly left her block and wandered in the dark to my bedside, but not being able to get upon it, had crept as close to the head of it, or to where she had heard me breathing, as she could get, and there remained almost motionless until I rose. During the last night she had come to the bedside in the same manner, and in the morning, on looking over, I saw her broad wing stretched on the floor cold and stiff.

> Saw the bold (falcon) stretched upon the plain
> No more through rolling clouds to soar again.—Byron.

"She had come to my bedside either under the vain hope of finding relief from me, or through a desire to be near me to the last."*

Regarding rural sports, of a becoming kind and properly regulated, as matters of no small national importance, exercising a powerful influence both on the physical and moral health of a people, we cannot but wish well to the few attempts that have been recently made to restore falconry to a portion of its long lost honours; and, there being no fear in the present day of the abuses that formerly attached to it, we can join issue with the author of the volume which has led to these remarks, in the hope "that we shall again see this noble employment revived in this country; that the hawk, which has been so long banished, and eagerly sought after to be destroyed, will be recalled and welcomed back "on perches proud to grace our halls," and that we shall again ere long behold the English lady,

> On palfrey fleet, with blushing face,
> Urge gracefully the airy chase;
> With hawk upon her milk-white hand,
> The fairest form of fairy-land,
> Or Dian-like, with silvan train,
> Gay sporting o'er the flowery plain."

Johnson's Farmers' Encyclopædia.—It has very seldom happened that books on agriculture have given a faithful and complete view of the science as actually practised at the time of their publication. They have, in general, been either greatly in arrear of the existing practice, or much in advance of it,—either engaged with the past history of the subject, or prospective speculations for its improvement. The principal cause of this, perhaps, is, that those who have written most on agriculture, are not those who have been most employed in its practical operations. An account of the proceedings of the farm, of sufficient detail and accuracy to be of much real use, could only come from one practically engaged in them, and the fact of his being so, is just likely to be the very reason of his never thinking of describing them. Indeed, the backward state of our earlier agricultural literature, backward at least when compared with the practice, for the latter was respectable when the former may be said to have been almost non-existent, was chiefly owing to the reluctance of practical men, the farmers of the country, to commit any thing to paper. It was quite foreign to their habits and disposition to do so, and a latent dread of the formality and responsibility of authorship, deterred many who were competent to instruct others, from venturing to appear in that supposed formidable character. Among the more primitive of the class this feeling, to a certain extent, perhaps still prevails, and joined to the difficulty, from a want of practice, of arranging their thoughts on paper, is doubtless the means of withholding from us the knowledge of many an important fact and observation, the accumulated experience of many an aged shepherd and husbandman, most of whose lives have been spent in solitary communion with nature, with ample opportunities, and no want of disposition or ability, to observe closely all the great natural operations on which the success of their various avocations depend. But agriculturists, in general, are now both able and willing to lay the results of their experience before the public, through the only channel, the press, by which they can become universally known ; and the result has been an accumulation of valuable matter, both of a practical and theoretical kind, relating to every branch of husbandry.

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* Page 95–99.

But much of what has been written on this subject is so diffused and piecemeal, so widely scattered over the pages of periodicals, reports, pamphlets, &c., that a great deal of what it concerned him to know, can scarcely fail to have escaped the notice of almost every agriculturist. The same thing, in this prolific age, may be said of almost every department of knowledge. The necessity of concentration has therefore become urgent. Encyclopædising is the order of the day: one of the prominent features in the mechanism for the diffusion of knowledge. It is not without its intrinsic advantages, presenting a certain amount of information on any given subject, and of the easiest possible access, thus admirably falling in with the spirit of the times, which is impatient of elaborate research, eager to arrive at conclusions, and appropriate the fruits of knowledge without paying the legitimate price. Its disadvantages, on the other hand, are neither few nor small. Constructed on a factitious principle, it can take no account of *system*, and presents no view of the mutual relation and dependencies of things; each stands out in its own naked individuality, claiming no kindred with another. It is like offering us the materials for a building when we might be put in possession of the building itself. If a *system* be well digested, there can be no difficulty in turning at once to the information wanted, even with little or no previous acquaintance with the subject, and we have the satisfaction of finding it in its own place, and associated with the other subjects with which it is naturally connected. An encyclopædia, however, is more easily compiled, and satisfies the wants of many. The popularity of these works at present is no proof, as has been alleged, of a superficial age, but merely of the general wish for information. A wholesome and eager desire for knowledge is not likely to rest satisfied with encyclopædias, but taking such as these supply, and all the better on that account, will push forward to the fountain-heads from which these compilations derive all that is valuable which they contain.

Among the many other benefits which the agricultural interest owe to Mr Johnson,—and they are well known to be neither few nor small,—they are indebted to him for the recent publication of a "Farmers' Encyclopædia, or Dictionary of Rural Affairs." It forms one of the extensive series of encyclopædias and dictionaries now in course of publication by Longman & Co., the execution or superintendence of which has been confided to parties particularly conversant with the different subjects treated of. The judiciousness of the choice in the present instance, fully appears from the value of the articles composing this volume. Every subject, whether of a theoretical or practical kind, which is likely to be of interest or utility to the farmer, is carefully discussed, at sufficient length for all useful purposes, and without running into too much prolixity or detail. On the one hand, we have an ample history, under the various heads, of the state of agriculture among the ancients, and its progressive changes and improvements among ourselves down to the present day; and, on the other, judicious suggestions in regard to the benefits which may yet be expected to accrue to agriculture from chemical, geological, meteorological, and mechanical science. Indeed, one of the most valuable features in Mr Johnson's work, is the care he has taken to shew how the most recent scientific discoveries may be made available in husbandry; and the rapidity with which these have accumulated of late years, has rendered all the older agricultural dictionaries completely obsolete in this department. Although the staple material of the work consists of the details of practical agriculture, and the results of those scientific inquiries by which this important pursuit is assisted and illustrated, many other collateral matters of interest to the farmer are introduced, such as the law with regard to certain parish and other public and private duties which he is often called upon to fulfil; the culture of the kitchen and flower garden; the history of our native plants; biographical notices, &c. Wherever the subject is of such a nature as to require it, illustrative woodcuts are introduced, and these, in general, are very well executed, and form a valuable auxiliary to the text. As examples of the manner in which the work is executed, we shall make a few short extracts. The various kinds of manures, a subject to which the author has devoted much attention, are treated of at great length. "The word MANURE, according to Todd, is derived from the French *manouvrer*. Lemon gives the derivation as follows:—'Manure, omnia a manu operando.' Skinner—all improvements in agriculture brought in by the hand. Webster, *Eng. Dict.*, says, 'Manure (Fr. *manœuvrer*, but in a different sense; Norm. *mainoverer*, to manure; Main, Lat. *manus* hand, and *overer* to work; Lat. *operor*.) A manure may be defined to be any fertilizing compound or simple ingredient added to a soil, of which it is naturally deficient; and as all cultivated lands should contain the earths, silica, carbonate of lime, alumina, decomposing organic matter, and certain saline substances, it is evident that in cases where any one of these is contained in the land in insufficient quantities for the supply of cultivated vegetables, that then the addition of that substance, either in its simple or in a compound form, constitutes the great art of manuring.

Fertilizers, therefore, naturally divide themselves into three classes, 1. The earthy, which are by far the most permanent portions of a soil, and are usually applied in the largest proportions; 2. The organic (vegetable and animal) which are the least permanent, and are used in much smaller quantities than the earthy; and, 3. The saline, which are the most sparingly applied of all the fertilizers, are the most readily absorbed by plants, and whose period of duration in the soil is longer than the organic, but less than the earthy. A manure is either useful to vegetation by affording in its simple or decomposed state, direct food or constituents, or else it is a fertilizer, by adding to the soil additional power to absorb and retain atmospheric gases and moisture. We shall see, hereafter, that most manures which are commonly applied to the land, assist the growth of plants in both ways. Looking at the question abstractedly, it must be evident, that as animals receive almost the whole of their nutriment either directly or indirectly from the vegetable kingdom, their excrement, or their decomposed bodies, returning these to the soil, must form the best manure.

With regard to inorganic substances, clay of the earthy manures, and some of the saline fertilizers, act principally by their absorption and retention of moisture. Gypsum, it is true, enters into the composition of some of the grasses, and, in minute proportions, other salts do the same; but, if we except phosphate of lime (the earthy salt of bones) none of the salts can be considered to be a very *general* direct food of plants. * * * Of the organic manures, those which most readily putrefy are the most rapid in their effects, but then they are the most speedily exhausted; thus, oil and fish, the most rapid of fertilizers, are exhausted by the first crop; while bones, which decay more slowly, will last for two or three. The effect of chopped woollen rags is excellent for two years, in the rich clay hop-gardens of Kent, and for three or four in the light chalky arable soils of the valley of the Kennet. * * * It is of the highest importance to the cultivator that he obtains a correct knowledge of the mode in which those manures operate which are found to be advantageous to the growth of his crops. He must discard from his mind all those false conclusions which are sometimes drawn with regard to an imaginary power assigned to plants of generating vegetable substances; for they can effect no such miraculous results. It is true, that they can combine the gases or elements of vegetable matters together, and form gluten, starch, gum, sugar, woody fibre, &c.; they can absorb and arrange with these the earths and saline bodies, but the oxygen, the carbon, the nitrogen, and the hydrogen, of which the first named are composed, and which plants usually obtain from either the atmosphere, or from the decomposition of organic matter, they can no more create than they can form the lime or the silica, which are as commonly present in most vegetables, as sugar, gum, or woody fibre. Whatever earthy or saline matters, therefore, are found in vegetables, must have been either derived from the natural soil or furnished by the manures added to it,—whether it be carbonate of lime (chalk), or silica (earthy matter of flint), alumina (clay), sulphate of lime (gypsum), or phosphate of lime (earthy salt of bone). It should also be a received axiom with the farmer, that there is no part of any decomposing anima or vegetable manure, but what is either, in its gaseous or solid state, the natural food of plants; thus, the gases emitted by the putrefaction of a dunghill are so much lost to the vegetable matters of the soil, and such an injury is never submitted to by the intelligent cultivator, but from an unavoidable necessity. Hence the value of green manures; for in these cases every portion of the decaying and fermenting fertilizer is gradually absorbed by the roots and leaves of the succeeding crop," &c.

The whole of the above article, which is long and elaborate, cannot fail to be perused with pleasure and profit. Of the short and more miscellaneous subjects, we may select the following as an example, as it contains facts which are probably new to the majority of our readers.

"*Eating of Earth.*—Stall-fed cattle, who have not the opportunity of plucking up the roots of grass, evince a great partiality for earth. It is seldom that a cow will pass a newly raised mole-hill without muzzling it, and devouring a considerable portion of it. This is particularly the case when there is any degree of indigestion, and it probably acts as a kind of gentle purgative. It is stated by Mr Youatt (*on Cattle*), that the celebrated Kynton ox always had a basket of earth standing near him, of which he occasionally ate a considerable quantity. When decomposition commenced, and the acescent principle began to be developed, and the animal felt uneasiness on that account, he had recourse to the mould; and the acid uniting itself to the earth, the uneasy feeling was removed. It is also probable that a putrid neutral salt was manufactured in the paunch, but this would depend on the nature of the earth. The absorbent or alkaline earth taken up with the roots of grass by sheep also neutralizes the acids of the stomach. It is usual to allow sucking calves to have access to chalk. In the stomachs of almost all animals, man not excepted, there is a tendency to form superabundant acids, which, if not corrected, impairs digestion, and interferes with the assimilative function, that which converts the chyle into the animal tissue or substance of the body. The importance, therefore, of correcting this, by the administration of absorbent earths, is obvious.

"It might become a matter of curious inquiry, how far this desire of earth in cattle has affinity to that of the human stomach, which leads the Otomacs, a South American tribe, to eat clay. It is an unctuous clay, containing an oxide of iron; and during some months, when provisions are scarce, an Otomac devours about three-quarters of a pound daily, and he does not suffer or become lean upon it. The negroes on the coast of

Guinea, and the natives of Java, and some of the other islands in the Indian archipelago, are also earth-eaters; and in this and other European countries, pregnant women and young girls in a state of disease connected with the uterine function, also evince a strong inclination to eat earth.

"Among quadrupeds, earth-eating is not confined to the ox tribe; for, when pressed for food, wolves in the north-east of Europe, rein-deer and kids in Siberia, all eat clay. It is probable that the earth operates as a mechanical stimulus to the stomach, and abates the sensation of hunger, which always attends certain diseased conditions of the stomach. But, whatever may be the cause, this instinctive longing for earth in cows and oxen should not be overlooked, and the animals should be supplied with it when they are stall-fed."

In perusing Mr Johnson's work, we have perceived a few errors, but they are of very trifling importance, and such as could scarcely be avoided where such a diversity of subjects had to pass under review. It is clearly and perspicuously written, full of useful and interesting information, and well worthy of being recommended as a valuable addition to the bookshelves of all our agricultural friends.

*Parnell's Grasses of Scotland.**—We are well acquainted with Dr Parnell's labours in the difficult department of natural history which treats of fishes. His exertions, which have by no means been confined to the Firth of Forth, but extended to various parts of the kingdom, have been rewarded by the discovery of no fewer than nearly a dozen well-determined species; and he has, at the same time, thrown much light on their distribution in this country, some on their anatomy, and not a little on various other points of their history. It is not, however, on this subject we mean at present to speak, although, if the occasion required it, we should not be deterred from doing so by any fear of a repetition of the question which was put to us after the publication, in our pages, of a treatise on herring-fishing,—to what branch of *agriculture* the subject belonged? The topic to which the present volume refers is all-important to the husbandman; for what occupies so much of his time and attention as the cultivation of the grasses? It is true, the cereal grasses are not here treated

* The Grasses of Scotland, by Richard Parnell, M.D. F.R.S.E., illustrated by figures drawn and engraved by the author. Blackwood & Sons, Edinburgh, 1842.

of; but, even with the exclusion of these, how much remains behind to claim the farmer's care!—the grasses which form the principal sustenance of his flocks and herds, which enter most largely into his permanent pasture lands, and compose the natural herbage of our hills, valleys, and woodlands. But, apart from views of direct utility altogether, how interesting it is to have the means of making ourselves easily acquainted with the tribe of plants which form the principal material in the green vesture which clothes the surface of our island—which perform so important a part in the colouring of the picture which Nature spreads out before us—so as to render the British islands, in this respect, the admiration of foreigners when they approach our shores. The olive groves of the sunny south, notwithstanding all the pleasing associations they conjure up, have yet a grey, sickly, and melancholy hue; even in Valumbrosa you can scarcely find a piece of green sward whereon to recline; the magnificent masses of foliage in a tropical clime either entirely usurp the soil, or are broken into patches, leaving here and there stretches of arid sand, on which the eye cannot rest with pleasure. But here the surface, while it is left perfectly open, is covered with a uniform and continuous carpet, kept by frequent showers in a state of such vivid green that it is not surprising Great Britain should have been compared to a gem; its verdure contrasting so beautifully with the surrounding ocean, that it may well be likened to an emerald set in silver.*

Although the turf which forms this covering is so uniform, and to the eye apparently homogeneous, it is composed, in general, of a great variety of different species of grasses, blended with each other in different proportions. With such of these grasses as are indigenous to Scotland, it is the object of Dr Parnell's work to make us acquainted. Of course, it comprehends by far the largest proportion of these plants found in Britain; indeed so small a number are peculiar to England and Ireland that we cannot help regretting that these are not included, and the work thus rendered a Gramina Britannica. The entire amount of the Gramineous plants occurring in the British Isles does not exceed 116 or 118, and of these Dr Parnell describes 95, thus leaving but a small proportion unnoticed. This omission, which was not originally contemplated, has been caused by the want of recent specimens of the grasses peculiar to England and Ireland, and the author promises to supply it as soon as these can be obtained.

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* "This precious gem set in the sea"—*Shak.* The "Emerald Isle" has no exclusive claims to that designation.

The great value of Dr Parnell's work consists in the minute and elaborate descriptions of the species, the care with which the characters have been investigated, and the extensive series of plates, *on which every species of grass found in Scotland is figured*. "In the description of each grass, the state of every individual plant has been carefully set down, so that, in the comparison of any two descriptions, the several differences between the species inspected will be at once apparent. And, in addition to this assistance, an endeavour has been made to point out the most prominent diagnostic marks between those species which are most liable to be confounded."* In prosecution of his researches, our author has had the gratification of detecting two or three grasses, either new to Scotland, or previously altogether unknown to botanists, one of them, *Poa polynoda*, in the well-trodden field of the vicinity of Edinburgh, where any novelty of this kind could scarcely be supposed to have been overlooked. In a family of plants so strictly natural as the grasses, the species in many instances are, of course, most closely allied, and difficult to discriminate. We well remember in our own case, and it was not a singular one, that the portion of our botanical books relating to the grasses, was long left unopened, as a subject which was not lightly to be approached, but requiring a long and laborious study to afford any satisfactory results,—just as it still is, to a certain extent, with the roses and carices. It may now be affirmed with perfect safety, that with the aid of Dr Parnell's work, no one will experience the least difficulty, even though he possess no previous knowledge of botany, in making himself acquainted with the name and history of any grass he may meet with in Scotland.

The plates, which are entirely the workmanship of the author, are engraved with great care, and form most valuable illustrations. We confess that, in general, we are no great admirers of amateur engraving. Gentlemen have very seldom inducements to devote sufficient time and attention to the subject, to enable them to master the difficulties of so delicate and laborious an art. To compensate for deficiencies in manipulation and artistical skill, we are generally told, that greater accuracy is secured, especially in delineating minute objects in natural history, such as the present. Of this we cannot help entertaining some doubt. The image to be represented may be perfect in the mind, but without having mastered the art of engraving, there is a deficiency in the power of embodying it,—the conception may be accurate, the means of expressing that conception defective. It is like speaking in a language with which we are imperfectly acquainted, when we are as apt to fail in saying what we wish, as to say what we do not intend. The way to avoid error in such a case, is to endeavour to convey a distinct notion of our meaning to one who has a perfect command of the means of giving it publicity in a form at once intelligible and agreeable. The best means of so doing, in such instances as the present, is by drawings; and these, accompanied with a few verbal instructions, would enable a professional artist to produce engravings alike accurate and beautiful. It is no great consolation to be told of inferior engravings, that they are exceedingly good under the circumstances in which they were produced; the public are entitled to estimate the value of such productions by their intrinsic merits. Neither is the case made better by alleging, that the success is considerable, considering the difficulty of the task; for the previous question remains, whether there was a necessity for undertaking it? In the instance now before us, the engravings are well executed, and the figures extremely characteristic; and such dissections and magnified views of the parts are introduced as are necessary for the full elucidation of the subject.

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* Preface, p. 1.

Its value, as a botanical work, is not the sole merit of this publication; much useful information is likewise supplied regarding the agricultural use of grasses. These plants vary in an extraordinary degree in their nutritious properties; it is not a little remarkable, also, that there should be so many of them which are rejected by all kinds of cattle, and which indeed appear to afford food to no kind of animal whatever. The kinds which yield such important services to the agriculturist form but a very limited catalogue. The Poa annua, the commonest of all grasses, flowering, it may be said, throughout the whole year, thriving in every kind of soil, and even extending on our alpine ranges to a height of 4000 feet, yields a soft and grateful herbage, apparently acceptable to every kind of herbivorous animal. It is remarkable for its extensive distribution, occurring not only throughout Europe, but in Northern Africa, North and South America, and in many parts of Asia,—almost a cosmopolite. For the fine flavour of the mutton derived from the highest grazing lands in the country, such as the sides of Benvoirlich, the high hills of Kintail, Benlawers, &c. we are no doubt principally indebted to the Festuca ovina, especially that delicate and slender variety of it named *angustifolia*. It is this grass which forms the greater part of the pasture grounds in the Highlands. "For permanent pasture," says Dr Parnell, "the produce and nutritive powers of the ryegrass, compared with those of the Cocks-foot grass (***Dactylis glomerata***), are inferior nearly in the proportion of five to eighteen; and inferior to the meadow fox-tail (***Alopecurus pratensis***), in the proportion of five to twelve; and inferior to the meadow-fescue (***Bucetum pratense***), as five to seventeen. The ryegrass is but a short-lived plant, seldom continuing more than six years in possession of the soil, but is continued by its property of ripening an abundance of seed, which is but little molested by birds, and suffered to fall and vegetate among the root-leaves of the permanent pasture grasses. It is only within these last forty or fifty years that other species of grasses have been tried as a substitute for the ryegrass in forming artificial pastures, it having been the favourite grass with most farmers from the time of its first cultivation in 1674, to the present period."—Page 143.

Selby's History of Forest-Trees.[*]—We have here another valuable work devoted to a department of the vegetable kingdom, of even greater and more general interest than that referred to in the volume just noticed, namely, the Forest-Trees of Great Britain. This is a topic of too great importance to the country, in every point of view, not to have called forth the frequent exercise both of pen and pencil. Works, therefore, both of old and recent date, treating of it in almost every aspect in which it can be contemplated, are by no means wanting, and many of them are of high merit. One of the more recent, and in some respects one of the most valuable of these, has already been noticed in our pages, and is probably well known to many of our readers, we allude to Loudon's elaborate Arboretum et Fruticetum Britannicum. But this is a field which cannot be too much cultivated, and will not fail to yield valuable results to every one who labours in it with zeal and intelligence. It is particularly desirable that every attention should be bestowed on it at the present time, in order that arboriculture may participate to the fullest extent in those improved views of general husbandry now beginning to prevail. Without referring to any other of the interesting points of enquiry which have been recently opened up, what a curious and important subject of investigation is afforded by the infusion of various liquids into the system of the living tree, by which its constitution and properties are capable of being so changed, that we may render its wood almost of any colour and smell we please, as well as materially influence its durability, texture, and other qualities!

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[*] A History of British Forest-trees, indigenous and introduced, by Prideaux John Selby, F.L.S. M.W.S., &c. Illustrated by nearly 200 engravings. London: John Van Voorst. 1842.

The present volume is one of a series of illustrated works on natural history now in course of publication in London. The first thing that strikes us upon opening it is the extreme beauty of the printing, and the careful finishing of the wood-engravings with which it is so copiously embellished. It is, indeed a beautiful volume in reference to every thing connected with what is now, not very elegantly, termed the *getting-up*. But we soon perceive, on examining its contents, that it has other merits besides pleasing the eye. The author is well known to be a close and accurate observer of nature, to possess the eye and hand of an artist, and to have the power of conveying, with readiness and accuracy, his conceptions to others. He is, moreover, what is of so much importance in the present case, a practical planter, one who is experienced in the art in which he undertakes to give instructions. Holding a middle place between the "voluminous and vast" tomes of Loudon, and the comparatively dry and technical details of a strictly botanical work, Mr Selby's book presents us with a comprehensive view of all that is most necessary to be known in regard to our forest-trees, conveyed in a very pleasing, instructive, and accurate manner. "His object has been to give, in as concise a manner as seemed consistent with the nature of the subject, such an account of the various forest-trees at present cultivated in Britain, as might form a volume of information interesting to the general reader, and at the same time one useful, as a sort of Manual, to the planter and those interested in arboriculture. With this view, in addition to the historical account of each species, the useful and ornamental properties of the various trees have been mentioned, and such observations made on their culture, or upon what may be termed the scientific departments of dendrology, as seemed consistent with his own experience, and with that of many others engaged in similar pursuits. * * * In speaking of the various important operations connected with the management of timber, the author may remark, that he does so with the experience of nearly forty years, during which period he has not only been a planter to some extent, but has also devoted much time and attention to the culture of his trees; his observations, therefore, may be considered the result of practical and oft-renewed investigation, conducted, as far as he was able, in accordance with the principles of vegetable physiology."*

Mr Selby is decidedly opposed to all kind of pruning of forest-trees, except the mere shortening in, or curtailment of, the lateral branches, and even that requires to be done with caution. Neither is he an advocate for the trenching of the ground before planting forest-trees, being convinced, from personal observation and experience, that no adequate or remunerating advantage, either by a more rapid growth of the tree or an improvement in the quality of the timber, is obtained, sufficient to compensate for the great additional expense incurred, without taking into account the difficulty in adopting it in many districts well adapted to the rearing of wood, or where plantations are made on that extensive scale now so prevalent throughout the kingdom.

We fully concur in the author's opinion, that the wood-cuts embellishing his volume are most beautifully executed. This is the case more particularly with the smaller figures illustrating the inflorescence, leaves, shoots, &c. With regard to the principal figures, the representations of our common forest-trees, our belief is that it is impossible, or next to impossible, in delineations necessarily on so small a scale, to give anything like a characteristic or distinctive appearance to the *leafing*, at least in the case of a great number of such trees; it may be done in the oak and a few others, even on a very small scale. With such as are of the latter description, the artist has been eminently successful; on those having a small and dense foliage, he has, perhaps, bestowed even too much labour. The mass of foliage reminds us of a cloud of smoke besprinkled with minute light coloured points: what we mean will be seen in the figures of the elms, and of the lime-tree at the opening of the volume. The skeleton and general mode of ramification are always highly characteristic.

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* Preface, p. 8.

Characteristics of the year 1842. By Mr TOWERS, M. R. E., Agr. Soc.—As much anxiety has prevailed, and still exists, concerning the state of agriculture, the operation, and probable results of the corn-laws,—the tariffs at home and abroad, and the prospects of the farming interest,—it is presumed that a concise review of the year, now approaching to its termination, will be found to merit attention.

It is true that meteorological observations taken in the latitude of the metropolis of England, are likely to vary materially from those of North Britain; nevertheless, the general character of the weather must be similar in several respects; and at any rate, a comparison of data cannot be void of interest, when that which governs the prices of the chief necessaries of life produces similar results in both countries.

They who recollect the very glorious and productive summer of 1835, will give credit to the assertion, that with its close we may date the last of a series of fine summers and abundant harvests. It will also be ceded (and this is very important), that, in consequence of the existing abundance, the price of wheat was reduced to a minimum; for a bushel of very good baking flour could then be purchased for 6s. or 6s. 6d.

The early summer of 1836, and we believe the promise of the harvest, were equally brilliant; but here we may safely refer to the evidence of the Quarterly Report in this Journal of that summer, to bring to recollection the awful thunder tempest of July 6th and 7th, when, during the course of many hours, the electric fluid filled the heavens, and fire, in sheets, "ran along the ground." This storm broke up the summer in Scotland; but in our midland counties, the fine weather remained triumphant for a time, and the wheat was secured; but desolation had commenced, and its progress, with every possible Protean form, continued till the middle of December 1841.

We do not mean to assert that fine weather was wholly absent for six years; but the seasons "were out of joint," uncertain, perplexing, in the extreme; and though corn was housed, no one can believe that the course of any one harvest had been consistently propitious.

The year 1839 was profusely rainy, and floods prevailed till the middle of February 1840; then a parching spring succeeded, but the harvest, on the whole, was safely brought home. 1841 was favoured with a spring of almost perfect character till the 27th of May, when occurred one of the most terrific displays of electricity, attended with torrents of hail, visited part of Berks and Hampshire: the heat, which on that day had been at 82°, suddenly receded. June was cold, July wet; and with the exception of about six weeks of fair weather, distributed throughout autumn, the quantity of rain was profuse, and deep floods covered the river valleys till nearly Christmas. Then fine drying winds, and bright skies, rendered the close of 1841 cheerful; so the new year opened with a promise.

The complaint, however, was widely spread, that the wheats had suffered severely in the swamped land. That they were so, partially, it may be admitted; but the vice of the present year was the return of drenching drains, which reversed the character of March, and again flooded the land; for so complete had been its previous saturation, that the first copious rain immediately filled the ditches; and we saw furrows, in thousands of acres, replete with stagnant water during the early weeks of April.

We now approach our object; for whatever anomalies in result, and perplexities of housing, have been observed during summer, may perhaps be traced to the swampy condition of the earth in March, succeeded immediately by a perfectly arid and parching April.

To convey some idea of the meteorology of that singular month, as it is recorded in a diary kept at an open and rather exposed district in the east of Berkshire, we cite the following particulars:—The average lowest temperature by night was very nearly 35° of Fahrenheit: on three occasions only the mercury descended a trifle below the freezing point—(3d, 5th and 6th of the month.) The maximum, by day, was, at an average, 50° every day, with three or four exceptions, being all but cloudless. Of the last sixteen days, three were overcast, with increased average temperature,—that of night being 41°—the maximum in the shade was about 63°.

Thus, during an unclouded period, without rain or frost, and nearly without dew,—for the wind was generally fresh from some point of the east,—the surface became hard-bound, superficially dry and warm, but cold at the bottom; hence the reports concerning the wheats continued to be discouraging; while the spring-corn was deposited in a bed certainly unpropitious to its *even* and healthy progress.

Hopes were entertained of genial rains during a considerable part of May; but that month, though entirely free from the blasting frost which had checked the hopes of almost every spring since 1834, was increasingly warm, very sunny, and with only a few showers at distant intervals. Barley and oats germinated at different periods, and advanced slowly and unequally; and it also was ascertained that the wheat would be short in the straw; the plant, however, was seen in flower prior to the close of the month,—a date fully fifteen days earlier than that of several preceding years.

June, to the 19th, retained the same character: wind northerly, maximum temperature at least 73° at an average. On the 19th, however, thunder showers introduced a change of wind to west and south, with considerably depressed heat. The growth of corn was checked; but lattermath grass and clover were benefited—the first cuttings having been short, and in some places very deficient.

July at first was rainy and cool, but the fine weather was re-established before the middle of the month; and thus the periodical rains of our climate being curtailed, it became evident that the summer would be fine. Crops progressed rapidly, but not with an even course. Wheat began to turn off rather irregularly, but every one said how great was the improvement which showers and warm sun had effected. Had the whole of June been fine and genial, much wheat would, indeed, have been carried during the last week of July. As it was, the first wheat which we saw ricked was on the 7th and 8th of August, and at that time, with a blazing sun, the temperature by day was from 72° to 83°. The three first weeks were very warm, day and night, the two averages being about 77° and 64° with us, while near the metropolis the thermometer was reported much higher. Farmers still complained—although barley was ripe about the second week—"that no one crop came on kindly, or according to expectation, under the influence of a sun so excessively hot; that patches were green, while in others of the same field the corn was shedding, and that in some instances the straw was dead at the ground while the grain was milky." These complaints were not groundless, and the fact clearly proves that something beyond mere solar power is required to effect the maturation of grain and fruit.

The rains of August were benign and seasonable; they did exclusive good, and brought on the turnips with astonishing rapidity. The verdure and luxuriance of this fine green crop were almost unexampled; and, what is singular, neither the fly nor turnip beetle (*Haltica*), nor grub (*Ægrotus*), had been discerned any where. In fact, the present may not only be reported "a turnip season," but "a clean" year; for surely never (with the exception of a numerous spring progeny of Aphides on the rose-trees) has there been a foliage more clean and luxuriant than that of the summer of 1842.

Of fruits there is at the time we write, and has been, abundance; but with the condition of the cider districts we can form only a conjecture, though there is every probability plenty. One circumstance adds another peculiar feature to the season:—the *apples fall off in profusion from the trees.* Every one to whom we have referred, and whose opinion and observation are worthy of attention, have the same tale; all gardeners agree that they never recollect a season wherein, from July to September, so much fruit had strewed the ground. Perhaps the scalding heat had checked the fluids, and even dried up the conduits of the sap; for so great was the power of the sun, that apples picked up and laid for a few minutes on a wooden surface, became partially coddled, as if by fire. But in the greater number of fallen apples we observed one or more perforations; and hence it may be concluded that some grub had touched the core.

A very great tendency to become mouldy was remarked. Bread made at home, which, under ordinary circumstances, could be kept for a week, failed in three days, the centre of a loaf either becoming ropy, or undergoing a sort of acid fermentation. Mouldiness in spots invariably succeeded this condition within a few hours. Numbers of persons also desisted from baking at home after June, and many public bakers were much perplexed in the process of fermentation. Meat touched by fly or insect became either mouldy, or ran speedily into the putrefactive fermentation.

To sum up the meteorological character of the summer, we observe that September, as is usual, set in changeable; but the heat, with great moisture, continued till the evening of the 7th day, when, after a curious grouping of small, leaden cumuli, floating under a dense grey covering of clouds, a tumult took place about sunset, which was recorded in most of the public journals, and ought to be chronicled with the storm of May 1841. The heavens blazed with sheets of bluish elementary fire, and the thunder rolled almost without intermission. Rain in torrents succeeded, and the summer was broken up.

The barometer had, as a whole, been high; but on the 16th it began to recede, and fell to 29 in. 30 cts. on the 24th. During this time the weather was fine, though the wind blew from west to south. Thus the autumnal equinox passed, indicative of a mild, wet winter. But suddenly the current came from the north or north-east, and so has continued consistently, and with force, to this day,—the rain commencing and continuing during this period; the mercury rising throughout. This rainy season was predicted by the late continuous depression of the instrument.

As a whole, the year 1842 to Michaelmas may be considered peculiar and anomalous; fertile, however, in its production, which generally are superior. May it not be regarded as a prelude to a series of fine summers, partaking in some degree of the ungenial qualities of by-gone years, but affording high promise of great melioration,—cheering to the hopes and prospects of agriculture, and with *that*, of all other branches of the population? May our hopes be realized!

Keeping Bone-Dust and Rape-Cake. By Mr JAMES HALKETT, Manager of the Perthshire Agricultural Company, Perth.—If bones are crushed, either in a green or damp state, and the dust allowed to lie in a heap together, it is certain to heat, and a violent fermentation will take place, in a shorter or longer time, according to the quantity of moisture and the temperature at the time; but, in general, it will be at the hottest, from the fifth to the eighth day, after which it will cool gradually. On this being the case, a diminution of bulk takes place; but this does not appear very perceptible until the mass is measured over, when, if measured before, it will now be found to come far short. This is well known; but as I find there is much misapprehension amongst farmers in regard to this phenomenon, and the proper manner of keeping both bone-dust and rape-dust, I think a few words on the subject may not be unacceptable.

That bone-dust, however dry, will heat more or less immediately after crushing, is a fact, which every one at all conversant with its nature will readily allow; but I find that the effects of the heating on the quality of the manure, is looked upon in very different lights by different people. Some request me to send them the newest ground bone-dust we have. From this I infer, they are of the opinion, that the dust which has been some time crushed is deteriorated in quality, or, in other words, is not so strong, and has lost part of its strength.

Others, again, ask the very oldest we have, and, in some cases, come themselves to see if they can discover any old stock about the premises to be supplied from. The former of these customers state, that they never have good turnips but from fresh bone-dust; the other, that the best turnips they ever had, were with old bone-dust. Both instances may be true; but, at the sametime, it may also be true, that both, from season and management, may have the best crop of turnips they ever had, with the worst bone-dust they ever used. As far as such experience goes, it asserts nothing in solving the question, which is its best state for raising a crop? but I have found them so wedded to their opinions, that it was vain to urge them to make a trial of any other.

That a change does take place in the value of the commodity, on being heated, I shall endeavour to show, as also, that after being heated it is a better bargain for the buyer than the seller. Suppose, then, from a parcel of good bones, although a little damp, a thousand bushels of bone-dust are made in February, and put past by the crusher, the weight of the same being 47 lb. per bushel. This is allowed to lie and heat, and cool again, until the middle of May, when another 1000 bushels are crushed from the same parcel, and the weight of this is also found to be 47 lb.; thus, the two parcels were equal when crushed. May being sowing time, both are sold to the consumers as they are; but, on the first being reweighed, it will be found to be about 49 lb. per bushel; and, consequently, instead of 1000 bushels in the heap, there will only be about 960. I have here made but little allowance for evaporation, for although it will be considerable, it is not the principle cause of the dust increasing in weight per bushel, and decreasing in measure; but by the heating it has become more friable, and the sharp points breaking off have allowed it to come closer together in the bushel. From this it is obvious, that the buyer of the old crushed dust gets 49 lb. for the same money, the buyer of the fresh dust gets 47 lb. for, being 4 per cent., and it will often be found much more. And I cannot allow that heating deteriorates the dust; for being an active agent in decomposition, it has already partly prepared the manure as food of the plants, to which it is to be applied, and on its being incorporated with the soil, it will consequently act more promptly. From this, I think, it will appear, that old crushed dust is the best bargain for the consumer; but the crusher, if he crushes before it is wanted, will lose in a corresponding degree, unless he charges more for it.

However, it often happens that it is in the purchaser's power to procure old dust, that has remained unsold on the previous season; which, if it have been long crushed and heated, will appear either of a blue or yellow tint, and, on examining it with a microscope, will be found full of mites. It may also be possible to purchase dust immediately after the season is over, at such a price as will more than remunerate him for the outlay of cash before next season. In either case it may be necessary to keep it by him for a length of time. On this being the case, when he gets it, he should put it on a dry floor, as a damp one rots it away very fast; it will heat again, but not so hot as at first, and every time it is turned about it will re-heat, which is occasioned by the re-arrangement of the particles and the admission of air into the mass. It should never be kept in bags, as it will destroy them in a very short time. It is injurious to boarded floors, both above and below it, but especially to the one above it, as the heat, going off at the top, condenses on the under side of the floor and rots it. When spread thin on the floor, it will not heat so much as when thick; but it should never be kept near horses nor cattle, especially the former, as they evince great dislike to its smell, for it will be found that, otherwise a quiet horse, if brought near it, becomes restive and troublesome.

If dust be got new from the mill in the sowing season, and in a fresh state, and it be desirable to give it a good heat (which I would strongly recommend), that can be easily done in a very short time. Take either sifted coal ashes, or the best earth you can get, a bushel for every two of bones, and mix them together, adding as much water as will make the whole damp. Turn the mass several times over until well incorporated, then leave it in a heap, and in forty-eight hours you will have it as hot as you cannot hold your hand in it. But in following the foregoing receipt, take care not to put more water than makes the heap merely damp, for, if it is saturated, you will defeat your purpose for a length of time; and although it will heat with much more ashes or earth amongst it, I would not recommend more, as it will then not dry effectually, and great difficulty will be experienced in getting it to pass through the sowing-machine.

I shall now make a few observations on keeping rape-cakes and dust. There are no rape-cakes made in the quarter from which I write—all being imported from the Continent. There is great variety in the appearance of the cakes imported into this country. What we consider the best is of a yellowish-green colour when new made, but they become darker on being long kept. On the receipt of a cargo of cakes they should be put into a warehouse in a dry day, on a dry clay or strong deal floor (for except by their weight they will do wood no harm), and neatly built close up, clear of the walls, in case they should draw damp from them; and as little, and especially damp, air as possible should be admitted into the apartment, as it is the cause of their becoming mouldy and losing their light colour. Should the cakes have been new made they will heat a little; but in general, after the sweat they have had in the ship this will not be great, and if there is any apprehension of heat, the small dust of the cargo, which has the strongest tendency to occasion it, should be kept by itself.

It is always necessary for the dealer, and often for the consumer, to have a quantity of rape in the shape of dust by them, in which case I would here reprobate a practice I have seen of flinging it down in a corner of a cart or turnip shed, where pigs dig and fowls scratch amongst it, and where it is exposed to the moisture of the air. However dry it may appear, and however dry it may be kept, on its being put somewhat thick together, sooner or later it will heat. When very dry, I have known it three weeks, or even a month, before it would heat; but if damp, it will do so in a short time, and then it will get hotter and hotter, until in the middle of the heap will be found large lumps actually burnt as black as soot, and which, on being broken down, are not easily distinguishable from coal cinders. This is a state in which carelessness may easily put it, and it should be avoided, for, although I am not chemist enough to state what change has taken place in it, I am afraid its utility is much impaired. To avoid this, it ought to be examined now and then, not merely on the outside, but by digging a hole into the middle, and when heat is discovered, the heap should be turned carefully over, and this should be repeated now and then; and although you may not manage to keep heat entirely away, you will prevent it being so strong as to burn the dust into the state I have described.

From what has been said, it will appear that my views are, that those who buy old bone-dust get a better bargain than those who buy new; that heating improves bone-dust, and therefore what is fresh ground ought to be heated before being used; that those who buy rape-dust should have it new crushed; and that heating impairs its qualities.

Schemes for Draining Land on a large scale.—The public mind is now fully alive to the benefits of thorough draining. These benefits are so important, and have been so well tested by experiment, that we think there is little danger of them being overrated, even when due allowance is made for the natural tendency of the mind to overvalue a new practice of fair promise. Even in the driest seasons which this country is likely to experience, such as the summer just passed, instances of the necessity for draining have every where met our eye. We may allude to one with which we were struck in perusing Mr Towers' characteristics of the present year, in a preceding part of this Journal. He mentions that after the dry weather had fairly set in, the corn did not ripen kindly, patches here and there appearing green, while in other places the grain was shedding from over-ripeness. This, to our mind, demonstrates in the clearest manner that the ground was imperfectly drained. And if such be the case in the driest seasons, we are entitled to use the most emphatic *à fortiori* arguments in regard to a wet one. But on the utility of draining, it may be considered superfluous to dwell; all being agreed on that point, the more important question demands attention—how can it be most extensively and effectively carried into operation?

One of the greatest obstacles is the expense. Notwithstanding all that has been done to cheapen the process, the first outlay must necessarily be considerable. This expenditure many tenants are not in a condition to incur; and even when they are, they are not unfrequently deterred by other considerations, such as life interests, trustships, yearly tenantcies, &c. The inability of landlords to make pecuniary sacrifices for this object, is often as great as that of their tenants; in the case of long leases, too, they may meet with difficulties in making proper arrangements with their tenants, in a matter from which the latter would derive the immediate benefit; but where none of these obstacles have intervened, not a few landlords, who are anxious to promote improvement, have advanced capital for draining, at the rate of 5 per cent. interest added to the rents, and this has been done to the advantage of both parties. Still, however, the principal impediment to the extension of this great national improvement has been the want of adequate funds.

Impressed with this conviction, several individuals have expressed their opinion that, rather than leave this object unaccomplished, it would be better to effect it with borrowed money. Lord Stanley gave this as his opinion at one of the meetings of the Royal English Agricultural Society at Liverpool. When the returns can be calculated upon with so much certainty, and are, at the same time, so considerable and speedily realized, it is not easy to see any important objection to this step; on the contrary, it seems to have every thing in its favour. Viewing it in this light, the next question that arises is, from what source is this money to be derived? A writer on "Land-drainage, Subsoil-ploughing, and Irrigation," after noticing Lord Stanley's remark, concludes by saying, "and were a company to be formed for the employment of capital in the draining of land upon the principles laid down in the act (this act we shall presently allude to), it would assuredly become an institution of not only national importance, but also of profitable investment, as resting on the sure basis of landed security." Acting on this hint, as well as his own independent convictions of its expediency, Mr Charnock of Wakefield has issued a preliminary prospectus for the formation of a Land-draining Association for Yorkshire. It is to be formed on the joint-stock principle; and although the application of joint-stock capital to agricultural purposes is in some degree novel, it is by no means unprecedented, and there seems no reason why this should not form as legitimate a field for its operation as most others on which it has been employed. Great facilities for carrying this design into execution are afforded by the provisions of an act passed in the Session of 1839–40, cap. lv., "enabling the owners of settled estates to defray the expense of draining the same by way of mortgage;" and "to charge all or any part of the lands so drained with the payment to any person or persons willing to advance the amount of money which may have been expended, together with interest thereon, to be paid off by equal yearly instalments of not less than twelve, or more than eighteen years, such instalments to be diminished or increased according to the greater or less improvement shewn to have been made by such draining. Or the parties may charge the said lands with a rent charge for any such period as aforesaid." Proceeding on the authority of this act, as far as it extends, and based upon its principles, Mr Charnock proposes to form an association with a capital sufficient for the parties contemplated to avail themselves of its provisions, and *generally* to afford to the Agricultural Interest of Yorkshire, on equitable terms, the requisite amount of means for the thorough draining of their land. As this is the first plan of the kind that has been proposed, and is calculated to lead to important consequences, we shall give a brief outline of the scheme, as drawn up by Mr Charnock.

He proposes that the subscribed capital should be L.500,000, in 20,000 shares of L.25 each; the first payment to be L.2, 10s. per share (exclusive of the deposit of 10s. per share on the allotment of the stock), and the remainder to be paid at such times, and by such instalments, as the progress of the Association may require, but no call to exceed L.5 per share; that the management should be in the hand of a Board of Directors, elected by and from the subscribers, and these assisted by men of practical and scientific skill in their several departments; that the head office should be in York, with agencies in the provincial towns of the county; that meetings of the Board should be held monthly, of the general subscribers annually; that interest at the rate of L.3 per cent. per annum should be paid to the subscribers for the first year, and afterwards L.5 per cent.; and that a general settlement and valuation be made every three years, and such BONUS then declared as the affairs of the undertaking may be found to warrant, *one moiety* thereof to be paid to the subscribers, and the other placed to the credit of the respective accounts of the parties draining. With the capital thus raised, it is designed to supply the requisite amount, either to owner or occupier, to *thorough-drain* their land, they repaying the same with interest, by half-yearly instalments, during a series of years, to be fixed either at an agreed rate per cent., or by a certain charge per acre, to be determined by competent parties, in proportion to the benefit the land has derived from the work; and which work must in all cases be done under the direction of the Association. The second object is to make tiles on the most approved plan, and in the cheapest and most convenient localities, so as to supply them at the lowest price; and, lastly, to take on suitable leases any land considered worthy of thorough-draining, and relet it after it has been subjected to that operation.

Such are the chief points in Mr Charnock's scheme. Of course many subordinate arrangements require to be made to bring it into effective operation; and on the manner in which these are managed, the success of the measure will in no small degree depend. The general principles on which it is founded do not appear open to any serious objection. If an association can advance a sum of money for effecting a great and permanent improvement, with perfect security to themselves, and a largely remunerating return for the accommodation, all parties concerned receive a decided benefit. It would become the interest both of owners and occupiers to avail themselves of such an offer, as it would secure to the former the permanent improvement of his estate, and to the latter a speedy return, soon exceeding the original outlay. We do not see that it is indispensably necessary that the work of draining should be performed by the Association itself. It is easy to suppose cases in which their officers and the farmer may take very different views of the mode in which the work should be executed, and the latter will be reluctant to give up, at the wish of another party, his own views, founded, as these often will be, on a long acquaintance with the ground to be operated upon. But the Association becoming the operating body, is, on the other hand, attended with not a few important advantages. They can command the services of men of the greatest skill and experience in all the departments, and by acting on a large scale, they can provide the requisite materials at comparatively small expense. By inducing the proprietors of adjoining properties, by the facilities they offer, to co-operate in a common system of draining, much disproportionate outlay on the part of individual owners may also be prevented; for it often happens, in such cases, and especially in level countries, that large drains require to be cut, forming conduits common to several different properties, the expense of which falls heavily on one individual, and unjustly too, for all the adjacent grounds, to a certain extent, partake of the benefit. It is only by draining on a pretty extensive scale that the country can reap the full advantages of the system: only a partial good is effected by conveying superfluous moisture from one spot and depositing it in another: unless it is fairly set off on its way to those great natural reservoirs which are its appropriate receptacles, we can neither expect an amelioration of climate, nor any other of the many important, though it may be indirect, benefits which arise from a well-conditioned soil.

Assuming that the cost of draining would be, on an average, L.4 per acre (the tenant giving his assistance in leading, &c., to bring it so low as that average), Mr Charnock is of opinion, that the comparatively small additional charge of 12s. 8d. per acre for twelve, and 10s. 6d. per acre for eighteen years, would return the outlay; and even this is assigning the entire charge to the tenant, although it is probable the landlord, in most cases, would bear an equitable proportion of the expense. This, it is calculated, would afford 7½ per cent. per annum interest to the Association in the periods mentioned, exclusive of the profit in making tiles. The periods of twelve and eighteen years, are those fixed by the Act before referred to, in the case of "settled estates;" but this would not preclude the Association from fixing shorter periods in those cases where the act does not interpose, and entering into such terms with the drainer as would best suit their mutual interests.

The security against loss, on the part of the Association, is amply provided for by the act, in the case of settled estates; in other cases, it is proposed to take one or more joint-securities along with the party draining, and also, if possible, in every case, to have the owner a party in the transaction.

We shall have much interest in observing how Mr Charnock's proposal is received by the landed interest of Yorkshire, as it is one pregnant with great results. Meanwhile, it has our best wishes for its success.

The above scheme refers to only one county, although that is the largest in England; another has been proposed by Mr Blacker of Armagh, which has for its object the effective draining of the whole empire. As we have given Mr Blacker's views at full length, and in his own words, among our Miscellaneous notices, we need not analyse them here. He thinks that, by an extensive and judicious system of furrow-draining, the national produce of wheat may be increased annually by 3,000,000 of quarters. In order to enable cultivators to drain on such a gigantic scale as he advocates, he proposes that the Government should set apart L.2,000,000 annually, advancing adequate sums to proprietors, and taking security on the properties thereby improved, for the interest at which the money could be raised, say 3½ per cent., and should make the payment thereof a first charge on the said properties. By adopting this suggestion, Mr Blacker is of opinion, that we should at once secure a sufficient supply of home-grown food, and afford adequate employment for the working population of the United Kingdom. Whatever merits may belong to this proposal, the interest of discussing it at the present time is diminished by the consideration, that it is not likely the Government would now be prevailed upon to act in conformity with it.

Whatever may be the ultimate fate of these, and such like schemes of national improvement by draining, they cannot fail to suggest one pleasing and consolatory reflection. They record the deliberate and unqualified conviction of practical and observant men, that the productiveness of the soil may be amazingly increased—that it possesses latent capabilities which we may call forth at will. The apprehensions of the farming interest, at this juncture, ought to be allayed by the consideration that a permanent reduction in prices may be met with a compensatory increase of production; and it is no small consolation to reflect, that, amid the vicissitudes of legislation, by which all great interests are liable to be affected, we have something to fall back upon which will again adjust the vibrating scales, and leave them in that equipoise which is most conducive to the welfare of all classes of the community.

Hannam's Prize Essay on the Application of Rape-Dust, and other Hand Tillages.—We have perused this little Treatise with much pleasure. It is written by Mr John Hannam, of North Deighton, Wetherby, and had a prize awarded to it by the Agricultural Association of that neighbourhood. It gives a succinct and perspicuous view of the use, nature, and application of manures in general, and then dwells more particularly on rape-dust, as a most efficacious agent in the process of fertilization. The substance so named, is the seed of the rape-plant after the oil has been extracted from it, and it has been found to contain matters highly essential to the growth of vegetables. Thus, according to one authority, eight tons of this substance afford as much nitrogen as 100 tons of farm-yard manure; or, according to another, taking all together, 1 ton of rape-cake equals 18.42 tons of farm-yard compost. The excellencies which we should thus be inclined to attribute to this fertilizer from theory, are shewn by Mr Hannam to be fully corroborated by practice. He regards it as of extensive application, but of particular value as a manure for grain crops. The experience he has had of its operation, enables him to deduce the following practical conclusions to regulate its application with respect to corn: 1*st*, That its effects are most marked upon thin, poor soils; 2*d*, That its operation is more beneficial in a dry season than in a moist one; 3*d*, That it is most *certain* in its effects upon the winter-sown wheat crops; but, *in favourable seasons*, most remunerative on the spring crops; *4th*, That it answers best on strong soils for the wheat crop; *5th*, That it is not judicious to apply large quantities at one time; *6th*, That it is necessary, after using rape-dust for several rotations, to apply a dressing of saline and earthy matters. This fertilizer is applied to the soil in two different ways, either by the broad-cast system, or by the drill; in the opinion of the writer, the latter method has numerous and decided advantages. When diffused over the surface, as a top-dressing, a great portion of the nutritive gases is wasted in the atmosphere owing to the quick decomposition of the rape-dust; much of it also is absorbed by weeds; and not a little is carried off by birds; all of which evils are avoided by the use of the drill. Mr Hannman has likewise found rape-dust a very efficacious manure both for turnips and potatoes. Its cost is about L.7 per ton, or from 21s. to 23s. per quarter.

Our author then passes in review the various other hand tillages, as they are somewhat oddly termed, and discusses the best methods of applying them. He brings to the task no small degree of theoretical knowledge, and that is tempered and regulated by considerable experience and extent of practice. At a time when the rationale of manuring is beginning to attract some degree of that attention which it so pre-eminently merits, the dissemination among farmers of such treatises as the present is likely to be attended with much benefit; for by leading them to consider in what properties their land is most deficient, and what kind of application is best fitted to supply the desired requisites, they will learn to manure with *discrimination*, which in too many instances is far from being the case at present. By using his best efforts to bring about this desirable result, the author of the present *brochure* has deserved well of the agricultural commonwealth.

The Farmer's Almanac for 1843.[*] — Since the duty was taken off almanacs, it is surprising to what extent that useful class of publications has improved and increased. There is scarcely any kind of profession, especially if it be of such a nature as to mingle largely in the general pursuits of society, which has not a work of this kind more exclusively devoted to its interests. And as to improvement, we need only compare the meagre, crude, and unsightly publications of a few years back, with the almanacs of the present day, to be at once convinced that the contrast is as striking as it well can be. They now embrace every thing that can by any possibility be expected in such works, while they exhibit an accuracy in the statement of facts, an excellence in the arrangement of their multifarious contents, and withal a beauty of printing and general style of finishing, which leave little or nothing to be desired. In our own locality, we are familiar with one which embodies all these merits — we allude to that phenomenon of its class, the Edinburgh Almanac; and many others are to be found of scarcely inferior value.

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[*] The Farmer's Almanac and Calendar for 1843. By Cuthbert W. Johnson, Esq. F.R.S., and William Shaw, Esq. London: James Ridgway, 190 Piccadilly. Price *One Shilling*.

The avocations of the farmer are of such a nature as to render a register of facts, like that afforded by an almanac, of no small utility. More than most others, he requires to be observant of terms and dates:—the times at which fairsare held in different parts of the country; the seasons at which many of the operations of the farm should commence; tables of the price of corn, dung, and other commodities in which he deals; the particulars of acts of Parliament relating to agriculture; and many other matters of detail with which he cannot, or need not, burden his memory, render a book of reference peculiarly useful. All the conveniencies in regard to such topics that an almanac can supply, have been afforded by the publication of the work whose title we have quoted above. It is now in its third year, and the increasing favour with which it is annually received, is the best proof of its usefulness. Indeed it could scarcely be otherwise; for, the gentlemen by whom it was projected and executed, were in a condition, on the one hand, to be well acquainted with the wants of the farmer, and, on the other, none could be better qualified to supply these wants. It seems to comprehend every thing suitable for such a work, as well as much interesting collateral information arising out of the subjects more strictly adapted to its pages. The Farmer and Gardener's Calendar is written with great care, and contains many more useful suggestions than are generally found under that head. To this are appended "General monthly Notices," the object of which is to give, among other things, the chief characteristics of the different months in regard to temperature, hygrometry, and the general phenomena of the weather. This department is executed with discrimination, and when the intelligence is not original, it is derived from the best and most recent sources. Biographies of naturalists and eminent agriculturists are occasionally introduced, and pleasingly diversify the drier details. One of the most elaborate and useful portions of the work, is a complete list of all the fairs and markets of Great Britain and Ireland, arranged under the respective counties in which they are held, with the dates, and a notice of the description of cattle or commodities for the sale of which they are most distinguished.

Anxious to make their work as useful as possible, the authors invite suggestions for its improvement. Availing ourselves of this permission, we beg to draw their attention to the following consideration, as perhaps worthy of being acted upon. In the tabular lists of the days of the month, the space allotted for remarkable days is filled up chiefly with the names of fairs occurring on the respective days. This is a useless repetition, as all these are to be found in their proper place, namely, in the lists already alluded to. Had the principal fairs been selected for this distinction, such a step would have been less objectionable; but this we do not find to be the case. The two great fairs at Newcastle, for example, each of them lasting nine days, are not so registered. Even this, however, would have been altogether unnecessary, and occupied a space which, we think, may be more worthily employed. We propose that it should be filled up, as far as the materials admit of, with the names of eminent agriculturists, important eras in the history of husbandry, such as the establishment or abrogation of laws relating to it, the institution of national societies, the introduction of great improvements, &c. Jethro Tull is the only individual signalized in the way we wish; and we should like to see such names as those of Tusser, Young, Cartwright, Berry, Coke, Davy, Sinclair, and a multitude of others, occupying similar positions, in token of the homage and gratitude we owe them for the benefits they have conferred on agriculture.

We cannot help thinking, also, that the work would be more acceptable if it were neatly cut and bound, and for this a small advance of price might perhaps be permitted. We say this with a perfect knowledge of the fact that it is the authors' wish that the copies should be bound together at the end of every *fourth* year, when they promise to give a general title-page and index. Let them cease to indulge the fond hope. Excellent as their almanac is, it must share the fate of all almanacs. "Useless as an old almanac," is an apophthegm almost become proverbial. It is not to be expected that the numbers will again be referred to after their year of service is expired. At all events, this is the less likely while they bear the form of pamphlets, which are generally, after a time, consigned to some dusty corner, where "nameless in dark oblivion they must dwell." By adopting this suggestion, the authors will do perhaps all that can be done to fulfil their desire of bringing their work out of the tribe of ephemerals, and giving it a more substantive and permanent being; and, at all events, they will thereby cease to sacrifice present appearances and convenience (for what we recommend will render the book more portable, and greatly facilitate consultation), for a futurity which, in ten cases out of twelve, the bygone numbers of the almanac will never reach.

Should Potatoes be earthed up as they usually are? By Mr PETER M'KENZIE, Gardener, Stirling.—There are few productions of the field that have occupied more the minds of the cultivators of the soil of late than the potato, and well it deserves their utmost attention. When we take into consideration the multitudes that depend upon it as part of their food, and the many failures that have taken place in the crop in past years in different parts of the country, these may be sufficient reasons for offering any remarks I have to make upon the subject. Various modes have been adopted for planting the potato, and different seasons of the year have been recommended since the time that Evelyn, in his Kalendarium Hortense, recommended that they should be planted in February, in the worst ground in the garden. For some years past I have been making observations and experiments upon the cultivation of that useful root, both in the garden and in the field, in soil that has been well drained, as well as in that which has been but partially so. My attention has been turned for some time to the common mode of earthing up potatoes in drills, and from facts that can be stated, the farmer and others will perhaps see cause to alter, in some degree, their present system of earthing their potato crop while growing. The time has been, when the plan that is generally practised was perhaps the best; but when the condition of the soil is changed, the usual mode of working it should, in some cases, be changed also. It is the common practice in the part of the country where my lot is cast, to make the intervals between the rows of potatoes by continued earthing, two or three inches deeper than the bottom of the dung in which the potatoes were planted in the spring; this plan, probably, was adopted when land was less drained than it is at present, in order that the roots of the plants might be beyond the evil effects of stagnant water, and also, that the stems of the plant might be supported; but when land is well drained, such deep earthing appears to be injurious to the crop. This may appear more clearly, if we consider for a little the nature of the food that nourishes the potato plant. We are informed by vegetable physiologists and chemists, that water acts a very important part in promoting the swelling of the crop. By means of it carbonic acid is conveyed into the plant; it also assists in decomposing the organic matter in the soil, which also furnishes nutriment for vegetation. We are also informed, that, by means of rain-water, ammonia is conveyed to plants to supply them with nitrogen. Now, if farmers and others, whose business it is to rear vegetables, were to give more attention to the manner in which plants feed, and also to the materials that supply them with food, perhaps they would receive greater benefit from such a study than many should at first be ready to believe. If the food and the feeding of vegetables were as well understood as that of animals, very different results for the better would be the consequence to the cultivator of the soil in the first place, and also to the community at large. Now, in thorough drained land, and in seasons like the one that is past, the common mode of earthing the potato crop appears to be hurtful to it. The deepness of the earthing below the dung, and the roots, allows the moisture to drain from both; and if it is certain that plants require water to form part of their solid tissue, or what mineralogists should call the water of crystallization, besides what is called the water of vegetation, these supplies being cut off, the crop must suffer, and, of course, disappoint the expectation of the planter; and if the potatoes are earthed up when the soil is moist, which is no uncommon case, the sides of the drills become smooth, and often harden in such a manner as to have some resemblance to baked clay, so that when rain falls, it runs down the sides of the drills, as if tiles had been laid to carry it off. Then the nourishment which the fructifying showers bring to the soil, for the benefit of vegetation, is, in a great measure, lost upon the potato crop. Such a mode of culture prevents the earth from drinking in the rain that comes oft upon it, that it may bring forth herbs meet for them by whom it is dressed. Persons may satisfy themselves upon some of these points, by going to a potato field which has been treated in the manner above described, with a potato-fork over their shoulder; and let them go after copious showers have fallen, and they will probably find the soil where the roots of the plants are as dry as dust, many of the spongelets shrunk and unable to perform their functions, when the well-being of vegetation depends in a great measure upon their preservation; the dung, instead of being finely incorporated with the soil, will have some resemblance to gramineous peat, and might be employed as fuel to boil the potatoes instead of food to nourish them—in such circumstances the potatoes will, in general, be a deficient crop,—their character will be dry, small, and scabbed.

Some gardeners, on the other hand, go as far wrong in the cultivation of some of their winter crops, in the culture of cauliflower plants under hand-glasses during winter, in order that they may have plenty of soil to earth up the plants in spring. They dig out a considerable quantity of earth, and put dung in where the earth came out, and return part of the earth above the dung, and then put in their plants. They are planted, as it were, in the cradle of a wave; the rains of autumn and winter are conveyed into the hollow; the roots of the plants are soaked in wet; and, what with moisture and frost, more than half of their crop is destroyed, and those that remain are poor, sickly looking things; however, they get what they wanted—plenty of earth to support those that remain.

But we must return to the potato; and perhaps the following account of experiments which have been made will shew the thing more clearly, and which may be easily done over again by those who desire to be more fully satisfied than merely reading an account of it. On well-drained land three modes of cultivating the potato were tried; the dung used being what is called well-made farm manure. The first was similar to the plan already described, namely, earthing up the crop until the interval between the rows was two or three inches deeper than the root and dung. The second plan differed only from the first in being less earthed, or what may be called by some a half setting up. The third mode had no earth drawn to the stems of the plants, and the earth was only hoed between the rows. The dunging of the crop, and the distance between the rows, were equal. When the potatoes were dug, the advantage of the second mode of culture over the first, was fully more than a third part of increase, and better in quality; for the potatoes grown by the first plan would not bring the same price in the market which the second would. The produce of the third plan was nearly equal in bulk with the second, but rather inferior in quality, many of the potatoes having their sides greened by being exposed to the light. While growing, the second and third lots had a much more healthy appearance than the first, and when dug, what remained of the dung that was used was well mixed with the soil: while the dung of the first lot was dry and little decomposed, clinging in clusters to the roots of the potato plants when they were dug. It would be little trouble for farmers and others who grow the potato, to try the experiment on land that has been well-drained, for it would certainly be a great advantage to themselves if they could increase their potato crop a third part more than is usually grown, and with less labour to themselves and horses. When we bear in mind the number of acres that are planted with potatoes, it must greatly increase the food of our country, both for man and beast, if 20 or 30 bolls were added to every one in the produce of that essential article of food.

When we remember the number of square feet there are in an acre, and if upon every square foot an extra potato were raised, weighing only one quarter of a pound, more than four tons would be added to the crop of every acre. Such a statement serves to shew how a small increase of crop upon a small piece of ground, extended over general cultivation, would add greatly to the produce of the farm ; and such an increase might be easily obtained, if more attention were observed in the preparation of the soil before planting, and the best mode of working it afterwards, together with a knowledge of the food of plants, and their manner of feeding ; for much must be lost to the cultivator of the soil by first collecting food, and afterwards serving it out for the nourishment of the crop, and then using means to deprive plants making the use of it that was intended for their benefit. Much might be learned that would be of advantage by studying the nature of roots, and observing the direction they take in pursuit of nourishment. In some plants the succulent points, through which the liquid matter of the soil is taken in, take a horizontal course, in others, a perpendicular. These may be seen in the potato and turnip. The roots of turnip penetrate deeper into the soil than those of the potato ; and the advantage of this might have been seen in many parts of the country where turnips have been cultivated this season. In the same field where pototoes were grown, part of it was cropped with turnips. The field was well drained, and both crops, as far as earthing up was concerned, was somewhat similar during the dry season. The penetrating roots of the turnip found nourishment and grew well, while the more spreading roots of the potato were half-starved.

Competition of Seed-wheat.—Competitions of seed-corn have long been instituted in this country, though it was only very lately that the Highland and Agricultural Society directed their attention to the subject; and perhaps their interference in the matter may have the same effect of bringing into comparison periodically, all the finest varieties of seed-corn in the country into one central focus—Edinburgh, and of disseminating them to every quarter of the kingdom, as their general shows of stock have had of comparing stock at stated places, and distributing valuable animals into every locality. The present year's trial was merely experimental, and has afforded many useful hints for future improvement; but to render the plan, perhaps, extensively interesting and useful, competitions will have to be held over the whole country under the direction of the Society; and then when all the prize seeds are sent to Edinburgh for comparison, the best will be secured for general distribution. The following is the account which we drew up at the time of the competition here, and enters sufficiently into particulars:—

The competition of seed-wheat in connection with the late General Show of the Society held at Edinburgh, took place in the Society's Museum, George IV. Bridge. It is to be regretted that the number of lots entered in competition were so few; and the circumstance is the more difficult to be accounted for, seeing that sufficient time has this year been at command to prepare samples between the termination of harvest labours and the day of competition; that the quality of wheat is so fine, generally, this season, that farmers might have been supposed to evince a little eagerness in shewing remarkably fine samples of their growths; and that a similar exhibition was so well attended lately at Dalkeith. Be the cause of the want of numbers in competition what it may, there was sufficient to ensure the purposes of the Society for a season; and as to the quality of the lots exhibited, they might have done credit to farmers in a finer climate than ours.

The wheat exhibited consisted of white and red varieties of different denominations, as follows:—

CLASS I.—WHITE WHEAT.

1. J. Wauchope, Esq. of Edmonstone; grown at Edmonstone, near Edinburgh—light soil. Produce per imperial acre, 4 qrs. Essex.

2. John Gibson, Woolmet; grown at Woolmet—loamy soil—5½ to 6 qrs. Chidham. 40 qrs. for sale.

3. James Fulton, Jameston, Girvan; grown at Jameston—soil approaching to sand—6 qrs. Pearl. 10 qrs. for sale.

4. John Dickson, Saughton Mains; grown at Saughton Mains—light loamy soil—6 qrs. Woolly-eared. 30 qrs. for sale.

5. James Fulton, Jameston, Girvan; grown at Jameston—soil approaching to sand—6 qrs. Chidham. 10 qrs. for sale.

6. John Proudfoot, Pinkiehill; grown at Pinkiehill—light soil—5 qrs. Pearl. 20 qrs. for sale.

CLASS II.—RED WHEAT.

1. John Proudfoot, Pinkiehill; grown at Whitecraig—light gravel soil —5½ qrs. Blood red. 10 qrs. for sale.

2. John Gibson, Woolmet; grown at Woolmet—clay soil—6 qrs. Belgian red. 12 qrs. for sale.

Of the white there were thus the Essex, Chidham, Pearl, and Woolly-eared varieties; and of the red, the Blood-red, and Belgian red, very like the old Lammas red. Of the white, the quality of all was fine, the chief distinction between them consisting in the way in which each lot had been handled. One, for instance, a Pearl, contained a considerable number of smut-balls; another, a Chidham, contained several seeds of weeds, those of the hairy tare (*Ervum hirsutum*), and lady's bed-straw (*Galium apparini*); another, an Essex, was ill cleaned, containing capes, chaff, and small shrivelled grains; while another, a Chidham, shewed here and there a barley or an oat pickle. These faults were easily detected by examination and sifting, and where detected, sealed the fate of the lots, however fine the grain may have been, provided others, unobjectionable as to quality, were found free of them. Three such were found; and there being three, the number required by the regulations to constitute a competition, the judges were empowered to authorize them to be distributed amongst farmers for trial. The judges were Thomas Oliver, Esq. Lochend, and James Tod, Esq. corn-merchant, Ormiston, Tranent.

The three selected lots of white wheat were found to belong,—the first, to Mr John Gibson, Woolmet, near Dalkeith, of the Chidham variety; it grew upon loamy soil, was remarkably free of any impurity, was a very fine sample of the variety, and it was stated that Mr Gibson had 40 quarters of the same to dispose of for seed. The second belonged to Mr John Dickson, Saughton Mains, near Edinburgh, of the Woolly-eared variety. This grew upon light loam, was a fair sample, and Mr Dickson had 30 quarters to dispose of for seed. On fixing on this variety, however, the judges remarked, in their report, that "they have some hesitation in recommending No. 4, designated Woolly-eared, it not appearing to them to be a description of wheat well adapted for Scotland, on an average of years; but without it the regulation instructing them to select at least *three* parcels could not be complied with." Since the publication in the paper of the judges' report, which we think it unnecessary to give here, we may mention, in regard to this variety of wheat, called by the competitor *Woolly-eared*, but very slightly deserves that appellation, as evinced by the ear, which has, we understand, very little of that character about it; so little so, indeed, that the judges would not, we are convinced, have remarked upon it as they did; but as the circumstances were, in which the wheat was exhibited in sample only and not in ear, they very properly expressed an opinion which every farmer in the country will respond to, in regard to the uncertain nature of a true Woolly-eared wheat in this usually humid climate. The circumstance which occasioned the remarks of the judges, shews the necessity, in future years, of exhibiting the ear along with every sample of grain. We understand that Mr Dickson's Woolly-eared wheat was obtained from the banks of the Bugg, in Poland, and sown for the first time last year; when, notwithstanding the very wet season, it proved not only a prolific, but a crop of very fine quality. The third belonged to Mr John Proudfoot, Pinkiehill, near Musselburgh, of the Pearl variety. It grew upon ligh soil, was good, and Mr Proudfoot has 20 quarters to dispose of. It may be mentioned that the Chidham and Pearl wheat are both new to this part of the country. Among the red wheat there was no competition, as only two lots being entered for exhibition; and on this point the judges remark, that "had neither of them appeared to possess much merit, they probably would not have adverted to them. The parcel, however, designated Belgian red, is of fine quality, and possesses those properties well known in practice to constitute a valuable baking wheat. The other, called by the exhibitor Blood-red, is not of fine quality." The new variety, Belgian red, was found to belong to Mr John Gibson, Woolmet; it grew upon clay, and Mr Gibson has 12 quarters to dispose of. The weights of the respective kinds are as follow:—

Mr Gibson's Chidham white wheat, .	65 lb. per bushel.
Mr Dickson's Woolly-eared, . . .	63¼ ...
Mr Proudfoot's Pearl, ...	64 ...
Mr Gibson's Belgian red, . . .	63¾ ...
Mr Proudfoot's Blood-red, . .	64 lb. 6 oz. ...

The object the Society has in view in instituting the competition of seed-wheat is, as expressed in their circular, to ascertain by trial, the white and red wheat, the produce of Scotland, which shall be found best adapted for the climate of, and for general cultivation in, Scotland. To obtain this object in the most satisfactory manner, it will be requisite to compare the results with the variety of wheat most generally cultivated at present—say Hunter's wheat; but where that variety is unknown, that kind should be selected for comparison which is best known in the locality in which the trial is made. To render the trial still more interesting, all the varieties of white, or all those of the red, recommended by the judges, should be tried in the same field, of the same farm, and at the same time. Parcels of four bushels each were distributed by the Society, through their seedsmen, Messrs Lawson and Son, to farmers who applied for them immediately, at the price given to the growers; and applicants desirous of having more than four bushels, the Society's seedsmen enabled to procure the requisite quantity direct from the growers.

We conceive that this new class of premiums offered by the Society will be the means of instituting an interesting set of experiments through the country—interesting to the experimenters in observing the comparative improvement of plants, valuable in themselves, and to the nation at large, as holding out the probable issue of determining the variety of wheat which will afford in Scotland the largest quantum of the "staff of life," as *bread* has been happily denominated, for to this test must the results of these contemplated experiments be ultimately subjected.

Insect injurious to the Barley Crop.—In our last Number we inserted a notice from Mr Chrisp, Rugley, respecting a species of insect which has more or less injured his barley crops for some years back. In consequence of the specimens of injured plants transmitted for our inspection not having at that time come to hand, we were unable to say any thing in reply to the question put to us respecting the name and nature of the depredator in question. The specimens have now reached us, and upon examination, we find that they contain only two examples of small flies, both of which are in an extremely mutilated state. One of them, notwithstanding, we had no difficulty in recognising as a species of *Chlorops;* the other is a small black-coloured ichneumon, which in all likelihood is parasitic on the fly just named. There can be no doubt that the *chlorops* is the insect complained of. One of the species has frequently been known to damage the wheat crops to a great extent both in this country and on the Continent; it is named *C. pumilionis.* We are not aware that any of them have been previously observed infesting the barley crops in this country, but there is one highly pernicious to them in Sweden. It is named *Chlorops Frit;* and the point is not satisfactorily determined whether it be a native of Britain. The debris of the specimen sent by Mr Chrisp are insufficient to enable us to identify the species to which his insect belongs. Its mode of procedure, however, is no doubt analogous to that of the wheat chlorops, of which an account will be found in the 2d vol. of the Transactions of the Linnean Society, in Loudon's Gardener's Magazine, No. 87 (July 1837), and in the 12th vol. of this Journal, at page 121.

We hope that our correspondent will continue, as opportunities offer, to watch the operations of this insect, and supply us with such particulars of its history as he may be enabled to ascertain. Perfect specimens of the fly are much to be desired, in order that the particular species may be determined.

JERSEY—AS REGARDS ITS HUSBANDRY AND AGRICULTURAL CLASSES.

If I had not observed the condition of the little farmers and labourers of that beautiful island with my own eyes, I should have been disposed to doubt the fidelity of the accounts given of it.

My stay there, it is true, was only for a few days, but during that interval I had opportunities of observing sufficient to convince me that there is no continual pauperism of *necessity* in that island. There are occasionally in the town of St Helier's and the villages distressed persons, as in every crowded community; but to meet cases of want, there are charitable district societies which relieve them,—as the result of low wages —dearth of employment—the high prices of the necessaries of life—a superabundant supply of workmen—or those fluctuations in trade which so often occur in Great Britain, and cause such general or local misery there. Jersey has no such afflictive visitations. During an entire week I did not see a mendicant in St Helier's.

Such a state of things strongly contrasts with the usual circumstances of the English, and far more with that of the Irish labourer; and though the superiority of comfort enjoyed by the Jersey peasant, arising from a constitution of things almost peculiar to that island (her sisters in the English Channel are somewhat similarly affected), cannot be attained by our rural population under circumstances essentially and *necessarily* dissimilar, it may not be uninteresting to point out what that enviable condition is, and to trace some of the causes which produce and establish it.

First, As to the soil, and management of it. The land is extremely fertile, and the length of time during which it has been subject to minute cultivation has rendered almost every rood (the sandy beach here and there excepted) productive. Except in a street, a cottage without a garden is seldom seen; and in those gardens are to be found in luxuriance what in most parts of our country are considered green-house plants, such as the hydrangea, the lemon plant, and varieties of myrtle. Orchards are very common, and the quantity of cider made in the island, both for home use and export, is very great.

When Dr Falle wrote his History of Jersey (I forget the period), he lamented that enclosures for orchards had become so numerous, as tending to supersede the progress of husbandry, and render the people lazy. Tillage had been much more extended antecedently to his time, and he attributed its decline to a cause which we of the present day would imagine to have produced the contrary effect, and to have added fresh vigour to the pursuit, namely, the increase of commerce. He accounts for the apparent paradox by stating, that the demands of commerce required so many hands from the island, that there were not sufficient left for the purposes of husbandry, and that the facility of purchasing corn on easy terms from foreign ports, checked the desire to cultivate grain crops at home; and he also says that the increase of stocking manufacture rendered the generality of the people idle, and gave them an aversion to the laborious operations of husbandry.

A great deal of woollen manufacture by hand, still employs the Jersey labourer conjointly with out-of-door work; it is an auxiliary to the heavier and more important labours which occupy him and his family in the field or the garden, but it does not supersede them.

The system of husbandry, compared with that in England or Scotland, is defective, as grain crops often immediately succeed each other, without regard to fit rotations, and there is a slovenliness observable in the minutiæ of field management; but in one particular the Jersey farmer acts most judiciously, in giving a very deep ploughing to his land occasionally. This proceeds from the necessity of preparing it well for field parsnips, which enter into his ordinary rotation.

The plough used for this purpose is a very ponderous and powerful implement, which requires from six to eight horses, and drivers in proportion; it turns over a furrow slice 13 inches broad, and sometimes 2 feet deep, and 2 acres are thus ploughed very generally in a day.

Now, this will appear a very extravagant mode, when it is stated that there are not more than six proprietors in the island who have 50 acres; that a farm of 20 acres is considered large; and that the majority of farms is under 10 acres, many of them far less. From the law of gavelkind, and other causes, it is a work of time and of great industry to enlarge a property there. Among the principal proprietors is Colonel le Couteur of Bellevue, honorary secretary of an Agricultural and Horticultural Society, under the patronage of her Majesty, established two years ago, a gentleman eminent for the neatness of his husbandry (on fifty acres), the completeness of his farm menage, which includes mill machinery for various purposes, and the superiority of his wheat. The Society, which have made some judicious arrangements to improve the breed of their celebrated cows, have not neglected the "small things" in husbandry among their objects, one of which is to restore the island produce of honey, which was once made to a considerable extent. But, to return to the trenching-plough, it is provided and worked on the joint-stock principle; it belongs to a certain number of little farmers, who club for the purchase of it, and combine their horses when the occasion requires; it takes its round on fixed terms of mutual accommodation. The principal trouble occurs on the first day of a series of ploughings, from the difficulty of making the whole team take "a long pull, a strong pull, and a pull altogether," but on the second day harmony is generally attained, and the work proceeds smoothly. Supposing that the parsnip crop comes once in a four or even six crop rotation, the benefit of this deep ploughing, which buries couch-grass, and all other weeds, and allows a free passage to the stretching fibres of the grain and leguminous crops is incalculably great. Of course it is only practicable in this way on deep soil.

What an excellent suggestion does this joint stock ploughing system offer to the small holders of Ireland, who, from want of animals possessed of sufficient strength, and a suitable plough only stir the surface of their land, even though it be a deep and fertile soil, except in the comparatively rare instances in which they practise spade husbandry.

Or, still better, because more practicable in Ireland, the landlord of many small farmers might keep, with great advantage to himself and them, a powerful plough, like that in Jersey, for turning over a deep soil completely, or one for loosening the subsoil in shallower land, and a team of horses or bullocks, for the service of those tenants, who should be required to avail themselves of this accommodation in certain rotations, and to pay, by the acre, for the work so executed for them. The Irish small holder is too poor to maintain any heavy-sized horses, to contribute to the purchase of an expensive implement; he therefore requires the aid of his landlord, who would himself derive a corresponding advantage from such a plan of co-operation: The Jersey occupier of even four acres, is comparatively an independent man; his field is his *own*—he has no landlord,—he can afford to help himself.

Jersey is proverbally productive of fine wheat (though not so heavy in the scales as the English), and the potato crop cannot be exceeded in quality or produce.

Nothing more strongly demonstrates the good effects of deep ploughing and consequent cleansing of the arable land in Jersey than its higher produce in wheat and potatoes, compared with the productiveness of the really fine soil on the opposite coast of Normandy, where very shallow ploughing is usual. The quantity of couch-grass which grows with the blade of wheat, is so great as to render it necessary to ledge the crop of corn when it is severed, in order to prevent the effects of fermentation from the parasitical grass.

Every British farmer knows, that the laying of wheat after the sickle upon the ledge from day to day, is injurious to the quality of the grain, and would be ruinous to it in a wet season.

The potato crop in Normandy, though good, is not equal in its produce to that obtained in Jersey, from the reason assigned.

I have little doubt that the vastness of produce of potatoes in Jersey is far more attributable to deep ploughing than to soil and climate, all which advantages are possessed in the parts of Normandy which I have visited.

There is much sea-weed used in field-husbandry, either fresh, as with us, or in composts, or *burnt* for the purpose of producing ashes, which latter mode I have never seen practised elsewhere, except for kelp-making. But sea-weed, which, in Jersey, bears the name of *vraic*,* is dried in summer, and used in the farm-houses for the double purpose of fuel and producing ashes, which are regularly applied to the ground, especially to potatoes. The vegetable alkalies thus obtained are no doubt highly stimulating, and improving to the quality of the potatoes, which, in moist seasons, are always deficient in farina when raised with sea-ware applied in the ordinary way.

Much of the soil of Jersey is indifferent, by no means partaking of the nature of the rich loams in parts of England and in Normandy, and yet the potato flourishes there in a surprising manner.

The orchards of Jersey are said to occupy a fourth of its area. Pasturage for cows also is very considerable, from the great demand elsewhere for the valuable milch-cows, for which the island is so celebrated, and butter for export and home-supply of the enormous number of consumers of that luxury, among whom the great majority of her farmers do not rank. The cows are almost universally tethered, and the grass of the orchards goes a great way towards their support. Lucerne also is a general favourite for them; and both in winter and summer they are extremely well kept. The bull calves only are taken to the market. I believe that the export of a bull is prohibited, and so fearful are these islanders of having their breed of cattle deteriorated by admixture with any other, that there is a tremendous penalty on the importation of any live cattle, except under some peculiar circumstances (and regulated by official authority), which might render their introduction desirable.

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* In all records it is called *verisicum* and *wrecum*, the *wrack* in Munster and some other parts of Ireland.

The only possible means of preventing a deterioration of the breed is by an occasional renewal of the blood from Alderney, supposing that island to have been the source of the parent stock, and a careful avoidance of too close intermixture of relatives. The breeders can obviate this by selecting from parents, which, though of the same race, are not related individually by close alliances.

When Sir Robert Peel was endeavouring to satisfy our agriculturists that there was no cause for alarm on the ground of the importation of foreign cattle, he might have found an argument in his favour from the market prices in Jersey; for it is a singular fact, that butcher's-meat has usually borne there as high a price as in Liverpool or in the other great English markets, although the Jersey butchers import the greater portion of it from France. If, without any duty and a very inconsiderable freight, beef or mutton are not, or cannot be sold in Jersey under English prices, it would appear as a fair deduction, that, with some duty and a more expensive freight, the meat of Normandy could not be sold in England at a rate that would tend to bring down market prices.

One-fourth of the corn grown on the island, on an average, is sent to England; and there is also an annual export of about 9000 tons of potatoes, 2000 hhds. of cider, butter in large quantities, and oysters and other fish to the value of L.40,000.

The famous *Chaumontelle* and *Colmar* pears form another item in the exports; the first, which often exceed 1 lb. each in weight, are sold to the London fruiterers at L.4 and L.5 a-hundred. Other fruit is also disposed of there from the same source.

Now, if a political economist were to lay down this doctrine, the population of a country, though far exceeding the number which its soil and fisheries, and manufactures are capable of maintaining, may increase rapidly, export largely, and possess every reasonable comfort, without any direct extraneous support, he would be considered crazy, or ignorant of the first principles of the science which he professes, and yet he would be fully borne out in his assertions by the actual circumstances of Jersey. Such a state of things in a world beset by restrictions of every kind as to commercial interchanges—and in many localities so over-burthened with a poor and half-starved population—would appear Utopian in character. Yet Jersey realizes what I have put forward in formal assertion. This to some will require explanation.

The extraordinary state of prosperity which Jersey enjoys, is attributable to the remarkable privileges which she enjoys by grants from the Crown of England from the reign of King John to that of Charles II. in return for her unswerving fidelity to the country in the periods embraced by those reigns; a faith which has never subsequently failed.

Among her privileges is that of being a free port. "She is empowered to send all articles being the produce of the island to Britain as British produce, and every description of merchandize, the growth produce *and* manufacture of the island to the British colonies the same as if they were British manufactured goods." By the latter part of the clause (*and* manufacture, &c.), she has the power of exporting to the British colonies articles manufactured in the island, though produced from foreign materials; for instance, as a free port, she receives leather from France duty free, and the shoes which are made from it in the island are exported to North America as Jersey manufacture.

When grain is dear in England, the Jersey farmer finds his sale market there, and he imports wheat from foreign states for his own use at a much lower price; and if he is not very honest, he contrives to send some of the foreign wheat, which he brings from the Baltic or elsewhere, into England as the produce of his own farm. *Mistakes* of this nature, no doubt, often occur, by which a profit is realized which the laws never contemplated. Speculations of this kind, to which the temptation is often very great, can hardly be prevented by any vigilance.

The wonder is, that a greater part than the fourth (or possibly third) of the wheat grown in the island is not, under such favourable circumstances, sent into England; but the

Jersey farmer usually likes to eat his *own* wheaten loaf, which he bakes but once or twice in a fortnight.

The farmers generally are very independent, *yet never above their business.* In illustration of this, I shall mention an occurrence in which a friend of mine was a party concerned.

He was out partridge-shooting, and wished to cross a farm in a locality with which he was not familiar, but felt some delicacy in trespassing on what he was told was the estate of Miss C —— (whose *seignorial* property is worth L.200 a-year at least), and occupied by herself. Overcoming his scruples, he advanced with his dogs into a field of potatoes, where he expected to find a way, when lo! the lady of the manor was pointed out to him. Here was Miss C ——, an envied heiress, with a linsey petticoat, and all other habiliments corresponding, picking potatoes with her hired workers. This is said to be characteristic of the ordinary farmers of the country.

But I must notice the comfortable circumstances of the little cottager who has, say, five acres of which he is proprietor. This land is probably worth L.5 an acre to him, but more from the privileges and collateral advantages which it secures to him than from its intrinsic worth. He tills some of this with his own hands and those of his family, with little or no aid from hired labourers (for he hates the disbursement of hard cash for any purpose), but with occasional assistance, on the principle of reciprocity from his neighbours. The joint-stock plough is of course available when necessary, and his horse or horses may be considered as part of the village or parochial team for the purpose; his fields and garden supply him amply with all that he wants. After disposing of whatever is most valuable of his produce, he lives on that which is least saleable, and buys little of any thing; even a great part of his clothes is provided for him by domestic industry; and the stockings, shawls, and petticoats of his wife and daughters are also home-made.

The dietary of the family is as follows:—Soup made in the Norman fashion, not in the style of Scotch broth described by a native of Caledonia to the French public, "bouilli d'avoine enriché de sel et de l'eau," but a compound of water, cabbage or turnips, and grease, the effluvia of which, while in process of cooking, is very offensive to a nose unaccustomed to it. This is the general family dish, for the milk and butter are sold at St Heliers, or to some of the English residents near the farmer's house, who may be without land or cow. Those who can afford, or are disposed to indulge in such luxury, put a little meat into the soup now and then, and with this important addition the mess is very palatable, though a less washy diet would be more nutritive, and therefore far better suited to hard working people. Soup of the conger-eel is also a great favourite, and this is by no means unsavoury. The more independent farmers introduce corned beef and pickled pork, or salt fish, to their tables, and live altogether very well. Tea and sugar, which are now among the necessaries of the labourer in England, are very cheap in Jersey, where sugar is not more than *half* the British price; and until the difficulties with China arose, tea could be had there for 1s. a lb., and the Jersey pound, too, carries more weight than ours, being 17½ oz. The Jersey farmer likes his tea in the evening, though he breakfasts and dines upon soup. The stipendiary labour in the fields is performed in most instances by the English and French, as the natives themselves are generally independent in this respect; and as those labourers receive 1s. to 1s. 8d. for a day's work, and women can earn near the town at weeding, &c. 10d. or 1s. per day, they are far better circumstanced than any of the same class with us, from the very low prices of the articles of life to which I have just referred, and of cider, which is a universal beverage.

By the way, every farmer has his own cider, and it is not very unfrequent to extract a hogshead of it from a single tree, so that the value of his orchard is considerable. But there is a want of classification in the apples; the ripe and unripe are mixed together, and different varieties compounded together (in the Norman way when half rotten) in stone troughs. The trough is composed of six or seven great stones cemented together, and hollowed deep with the point of the hammer, the whole being a perfect circle, and from twelve to fifteen feet in diameter. The apples are crushed in this trough by a large mill-stone turned round by a horse; the mashed apples are then removed to the press, where they are piled up in a peculiar way, and the juice is squeezed out to the quantity of four or five hogheads at a time. One trough will keep two presses going, and where there are two in a house, there will be easily made twenty-four hogheads per week.

The festivals of Christmas, New Year's Day, and Easter, are periods of especial hospitality and such merry-making as used to be common in England at those seasons, and break the usual monotony of the Jersey peasant's life.

Mr Inglis, in a few words, gives a graphic picture of the life of the Jersey country man. "Christmas time is, indeed, a week of feasting and merry-making. On these occasions the *soup à choux* is discarded; fresh pork is substituted for its pickled relative; roast beef, such as would not disgrace the table of an English squire, takes its place; perhaps even the market is defrauded of its goose, and even puddings smoke upon the board; mountains of cake, too, accompany tea; and punch and hot wine laugh for once at frugality. But eating and drinking, although the staple amusement, is not the only one. Cards and dominoes are introduced, and sous are freely sported, while the Christmas song, the laugh, and the jest go round. Dancing, so universal on such occasions in England, is rare in Jersey. I have often enquired the cause of this. They say it is inconsistent with the solemn origin of Christmas."

Such comforts, with ample means of enjoying them, are the lot of the Jersey farmer and humblest peasant there, arising from the peculiarity of the financial circumstances of that happy island, owing to the maternal care of England, which is subject to no duties, no taxes, except what are necessary for internal improvement.

But as Providence has affected even the most prosperous condition with some disturbing influences, there is in Jersey, in the very countenances of the majority of the natives, unequivocal indication of a relaxing climate. There are periods of the year in which the bracing breeze of our mountains, or the dry and elastic atmosphere of the midland counties of England, would be welcomed as a blessing.

Considered, however, in all its bearings, that lovely island is the best circumstanced and most independent little province imaginable, and well deserves her appellation—"The Queen of the Channel Islands."

MISCELLANEOUS NOTICES.

1. ***Thoughts upon the subject of Securing a sufficient Supply of Food, and adequate Employment for the Working Population of the United Kingdom.*** By Mr Blacker, Armagh.—Notwithstanding that the recent improvement in trade may have given relief for the present to those depending on manufacture for subsistence, yet the dreadful privations to which this numerous class has been so lately exposed, appears to have left a very general impression upon the minds of all those who have thought upon the subject, *that something must be done* to guard against the recurrence of similar sufferings.

In proof of the prevalence of this feeling, it may be observed, that almost without exception, the conductors of the daily press have from time to time dilated upon this topic in their leading articles,—*some* calling on the Legislature to provide a satisfactory guarantee against the danger apprehended; *others* asserting the entire inefficacy of any legislative interference; but *all* admitting that *the something must be done,* whilst *each* appears to be equally at a loss to point out what *this something ought to be,* and have done little to elucidate a subject of such interesting inquiry.

Under such circumstances, it is not unnatural to suppose, that the public will be inclined to give its best attention to any suggestions which may lay claim to practically meet the evil in question, under which impression I venture to offer the following observations, trusting they will not be found unworthy of serious consideration.

It appears there have been 12,000,000 quarters of wheat imported, from the summer of 1837 to the summer of 1842, the import price of which, *free of duty,* cannot be calculated at less, upon an average, than 50s. per quarter. The nation, therefore, must have paid L.30,000,000 sterling for its foreign supply of wheat, during this period; and the increasing population, coupled with the present depressed state of commercial and manufacturing industry, naturally excites alarm lest a similar outlay should hereafter become necessary to provide food for the future.

The extent of land under wheat, in the United Kingdom, is estimated at about 8,000,000 statute acres; of course, if the average produce, per acre (now supposed to be under 24 bushels), could be increased to an average of 27 bushels, this would yield an increased production of 24,000,000 bushels, or 3,000,000 quarters, which is more than the actual import of any one year, during the above-mentioned period, and nearly one-half more than the average amount of the annual importation. Or, supposing that 1,000,000 additional acres were brought into wheat cultivation, and produced merely 24 bushels per acre, the same result would follow, say an increased annual produce of 3,000,000 quarters.

In considering how such an increased produce could be obtained, I beg to remark, that for several years past there has existed a practice among improving landlords, who have had the requisite funds at command, of advancing the necessary capital to their tenants, to furrow drain their farms at 5 per cent. interest to be added to their rents, which practice has been attended with the greatest advantage to all parties concerned; and if it was extensively adopted, *such has been the increased produce obtained thereby*, that no man who has had the opportunity of observing it, can doubt but that between the additional acres brought into wheat cultivation and the improvement of the lands now under that crop, the extra supply proposed of 3,000,000 quarters might not be easily obtained.

Under these circumstances, therefore, let it be supposed that the Legislature should take upon itself to furnish the money required for this particular object, taking security upon the properties to be thereby improved, for the interest at which the money could be raised, say 3½ per cent., and should make the payment thereof a first charge on the said properties (to be collected by the excise collector of the district, in like manner as the quit-rents are collected upon estates in Ireland), and it becomes evident that means would thereby be afforded of carrying this practice into effect to any extent, without any additional burden being entailed on the country.

Now, supposing such a plan had been adopted in 1837, and that the sum of L.2,000,000 sterling annually had been advanced, in the manner just proposed, there can be little doubt that now, in 1842, we should have secured, at an expense of L.10,000,000 an addition to our home growth of wheat equal to all we have imported in any year of the greatest scarcity; and this supply would not have been secured for *this year only*, but would be secured *for ever*, and the outlay of L.2 000,000 annually would also have produced such a fund of employment as would have not only kept every *agricultural labourer* from the workhouse, but would also have supplied a valuable fund of employment for the manufacturing operatives (who had either been withdrawn from *that* class, or had outgrown factory labour) to fall back upon; whilst the new land reclaimed would *annually* afford the *additional* demand for the labour required for its cultivation.

The adoption of this national plan of providing national employment, and promoting national improvement, is strongly supported by the following considerations:—

1stly, The certainty of its being fully adequate to its object, which becomes apparent, when the number of the acres of reclaimable land in the United Kingdom, which may be brought into profitable cultivation, by the operation of furrow draining, and the number of acres of arable land, already under the plough, or in pasture, which may be improved thereby are taken into consideration.

2dly, That this plan would be acted on to such an extent as to produce the practical results desired, we have this satisfactory security—namely, the self interest of all the parties concerned in carrying it into effect. The landlord would be glad to promote an outlay which he would at once perceive would ensure to him a very great increase to his rental, at the expiration of the leases existing on his estate, without his being obliged to lay out anything; and would, therefore, be most anxious to encourage his tenant to avail himself of such an offer, if made by the Legislature; and the tenant would be equally well inclined, as *he* has been hitherto deriving advantage from the same practice, paying 5 per cent. interest, and would of course derive still more by being subject to only 3½ per cent. It is, therefore, reasonable to conclude, that his anxiety to avail himself of such an offer from the Legislature, as soon as possible, would create such a demand for labourers, as would secure to them remunerative wages, and the kind of labour—merely digging a drain—is of a nature so simple, that the most ignorant manufacturer would feel himself competent to undertake it.

3dly, The improved produce obtainable by furrow draining, is not confined to wheat only, but is felt equally in regard to all other kinds of grain, as well as green crops; and the food of stock being thereby augmented, the supply of flesh meat would be increased in the same ratio as that of bread.

4thly, Great, however, as these advantages may be considered, they are by no means all that the community may expect from the extensive carrying into effect of the plan proposed. We have of late seen but too frequently how much the public prosperity has been compromised, by the exportation of the precious metals, to pay for the import of the wheat required for our subsistence; and not merely the actual occurrence of such a demand for gold for export, but even the very apprehension of it, has exercised a baneful influence over the manufacturing and commercial interests of the empire. All such fears would be for ever set aside, if there be any truth whatever in the foregoing representations; and a bright prospect of national wealth and independence would be opened to our view, without diminishing the welfare or happiness of any class, but, on the contrary, most materially conducing to the comforts and enjoyments of *all*.*

5thly, If the adoption of the foregoing plan would be attended with such beneficial effects to the present generation, it will prove, *in itself*, a most powerful means of extending its benefits to generations yet to come. For, let it once be granted that the plan shall be adopted to such an extent as the wants of the country may at present require, the fall in the price of agricultural produce will be such, that every farmer, who will not follow the example set to him, of increasing the *produce of his land*, in order to indemnify himself for the diminished rate at which *it must be*

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* Let it not be supposed I mean to affirm that the export of precious metals ought ever to interfere with our commercial or manufacturing prosperity; I maintain the very reverse, and think I could prove that, under currency laws, more suited to the enormously increased capital and extended commercial operations of the United Kingdom, nothing of that kind could or would take place. I merely allude to what has been the case, and may be again under the currency laws now in force.

sold, will not be able to pay the rent of his farm; and if HE *will not* avail himself of the offer held out by the Legislature, he will soon find himself compelled to give up his land to *some other that will* —an alternative he will not be likely to adopt; and thus the wheel being once set in motion, will be carried on by its own impetus, and increased employment, and increasing production, cannot fail to keep pace with the increase of population, however rapidly it may take place.

6thly, If the population and wealth of the United Kingdom was thus increased, our 50 millions of taxation, which presses so heavily upon the nation at present, when hereafter levied off a population, and an expenditure so augmented, would scarcely be felt at all, and seems the only legitimate mode of lessening the public burdens now left to us.*

Having thus shewn that the proposed plan is adequate to its object, and pointed out some of the arguments in its favour, it remains only to be considered, what obstacles may arise to prevent its being acted on, as far as the limits of a letter will permit.

In this respect the objections ought to be very strong to overbalance the advantages which the plan appears to offer. Its adoption will literally cost the public nothing—the rent-charge on the properties improved will cover all the liabilities—the Legislature will merely be the medium of bringing together the capitalist and landlord, the parties who are concerned in the transaction—the interest being secured as a first charge upon the lands, can in no way be likely to bring the Executive into embarrassment;—the facility of its collection being sufficiently proved by the ease and punctuality with which the quit-rents in Ireland have been constantly collected.

Again—The plan is free from the objection generally made to Government outlays, on account of the extravagance attending them, for the correct expenditure of the money is, it may be said, guaranteed by having the self interest of those concerned engaged on the side of its faithful disbursement. The landed proprietor is interested to see that the money is well laid out, the interest of which is to be a charge on his property, and upon the judicious outlay of which the advantage to be derived by him, in the future setting of his lands, must plainly depend: and the tenant, who, during his tenure, will have this interest added to his rent, will be always on the spot, and anxious to see the work properly executed. So that it would appear by no means unlikely, that a single government officer, in each county, might be able to examine and measure the work, and make the necessary returns to the excise, of the amount to be advanced in each instance, and the charge to be annually collected.

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* After the delivery of Mr Smith's (of Deanston) lecture on furrow draining, during the meeting of the Royal Agricultural Improvement Society of Ireland, at Cork, it was stated by a gentleman who had known Mr Smith's property, that though it was *now* worth L.4 an acre, it was not worth more than 2s. 6d., before the improvements he spoke of, in draining and sub-soiling, had been carried into effect. If an improvement to one-fifth part of this extent was made throughout the United Kingdom, who is there that would be bold enough to set bounds to the population it would employ, of the wealth it would produce? The *doubling* the wealth of the nation lessens by one-half the pressure of the same amount of taxation, and shews the only means by which such a reduction can ever be fairly attained; but the improvement here spoken of puts into the back ground the supposition I have made. But it is to be observed, I speak merely of advances for the single object of *furrow draining*, because that is a work, the execution of which can be accurately ascertained, and the fair expense of it duly estimated. The plans, therefore, being confined to this process, is free from the practical objections to which perhaps every other would be liable, and money being advanced for this would leave the farmer better able to carry on other operations without further assistance.

No objection can be reasonably made by mortgagees, minors, or those in the entail, because it has been already proved to demonstration, by the actual practice of hundreds of landlords and tenants, that the plan contemplated enhances the value of the land to the one as *owner*, and to the other as *occupier*, in a ratio very much exceeding a charge of 5 per cent. interest; and it must, therefore, be evidently for the advantage of any one, whether immediately or remotely concerned in the soil, to have the same description of improvement made upon it, at a charge only amounting to 3½ per cent., which, in charging the land with a certain payment, does not prevent the mortgagees, or other claimants, from entering into possession of the rents, when legally entitled.*

I beg, therefore, to urge upon the consideration of the public, that here is a distinct and specific plan submitted to its examination, apparently fully adequate to the object proposed, and *perfectly within the power of the Legislature to carry into effect;* and though it may seem confined in its operations, to the mere accomplishment of its avowed objects, will also be found well calculated to increase the salubrity of the climate of our country, and of course promote thereby the health, the happiness, and longevity of its inhabitants.

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* This last winter I have drained about 30 acres of land, statute measure, the drains 3 feet deep, and at a distance of 1 rod, or 16½ feet; and in order to procure stones to fill the drains, the soil was trenched 17 inches deep with the spade. The expense of the two operations combined, was about eight pounds per acre, which I feel certain will be repaid by the two first green crops, and the lands which had been formerly under the plough, and had been also limed and partially drained, so as to render it worth a rent of 20s. per acre, will be now better worth 32s. 6d. to 35s. per acre; so that after all the outlay incurred has been paid back, there will be a permanent addition to the rental effected of 70 to 75 per cent. This is no exaggerated statement, and will surely satisfy any mortgagee that his security will be in no danger of being impaired. "Should such facts as these, when fully established by evidence, be thought sufficient to set aside any reasonable objections that could be made by the mortgagees against making the interest on advances made for furrow draining, a first charge upon the properties thereby improved, there can be no doubt that private capitalists would make the advances required *to any extent* at 4 per cent.; but the interference of the Legislature, by guaranteeing the punctual payment, would ensure the advance at 3½ per cent., which is an object of the highest importance, and ought not to be lost sight of.

If the experiment should succeed, it will most inevitably confer a certain degree of independence upon the operative, by opening to him a new and abiding source of healthy and remunerative employment; if but partially successful, it may nevertheless be found adequate to withdraw from the workhouse every able-bodied inmate,—and if, unfortunately for the cause of humanity, it proved an entire failure (which could only arise from the want of applicants), no loss could thereby be entailed on the public, as no expense will be incurred by making the trial.

The offer on the part of the Legislature is all that is required in order to put the matter to the proof, for if it is accepted by the Landed Proprietors and their tenants, employment to the same extent must follow. The offer of a single million would be sufficient to shew, whether a plan so apparently unobjectionable would work well or not; and will the nation, which has *actually paid Twenty Millions* to liberate the negro, refuse *to guarantee the mere* INTEREST of the twentieth part of that sum (for which such *counter security* will be given), when the object is to relieve the perhaps not much less painful sufferings of our own fellow countrymen. I trust not—but as some may perhaps be frightened at the extent to which this plan might be acted on, and may feel inclined to demand what limits were to be placed to such an expenditure, to this I can only reply, that it would appear to me to be a legitimate object with all governments to provide employment and food for the population under their rule; and this plan, if proceeded on to a greater extent than the employment and food of the population required, would correct itself by *such an* enhancement of wages and fall in the price of agricultural produce, as would render the plan unremunerative; therefore beyond this extent the plan would not be acted on, for it *would* then cease to be the interest of the Landlords and Tenants to undertake the outlay.

It may be said by some, that if such advantageous results are to be obtained from furrow-draining, why do not the landlords and tenants carry it on to the extent necessary, without the Government interfering? My answer is, that landlords and tenants are doing what they can, but the obstacles which the pecuniary embarrassments of landlords, and the entails upon their estates, have prevented heretofore, and (most probably) will in future continue to prevent the practice keeping pace with the increase of the population, and the wants of the nation.*

Others, no doubt, will be found ready to object—that the interest would not be collected—that the national debt would be increased, and much more to the same effect. In answer to all of which, I simply ask—is it admitted that the practice of furrow-draining will accomplish the object stated, of increasing the national produce by 3,000,000 of quarters? if this is denied, let that (foundation which in the foregoing I have assumed) be inquired into, by a committee, and hundreds of landlords and tenants will prove the fact. If, on the other hand, my premises are admitted, but it should be denied that 10,000,000 are sufficient to produce the effect anticipated; I then say, let it be taken at 15,000,000, and I ask, would it not be better to have expended 15,000,000 to accomplish a *permanent* annual supply of home grown wheat, which would reduce prices to a moderate rate, than to pay 30,000,000 for a *temporary* supply, sold at a famine price? Surely it would be better to give half the money as a *gratuity*, and receive no interest whatever, in order to guarantee us against double that expenditure, which has just taken place, and affords no guarantee whatever against a similar outlay hereafter. This single statement cannot fail to set aside all the minor objections, which may arise in the details, and which a practical experiment would afford the means of guarding against. The supply of national food—the securing of national employment—the turning our superabundant capital to *our own national improvement*, in place of sending it for investment to foreign countries, are objects which cannot be lightly regarded, or sacrificed to mere supposed difficulties. Let the experiment be tried—the offer of the Legislature must do good to the extent it may be acted on; to the extent it is not it can do no harm; and to make such an offer no fixed outlay is necessary, and therefore no loss can thereby be entailed on the public.

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* From the example given in the preceding note, where L.8 an acre has been expended in draining and trenching, and supposing the draining to cost only one half, it is evident that all the disposable capital of all the landlords and tenants in the United Kingdom would be insufficient, without national assistance, to keep pace with the wants of the increasing population, and that at the rate of two millions advanced annually, it would take centuries to perfect the thorough drainage of the national territory.

Having committed these ideas to paper, in the humble expectation of the subject being taken up by persons more competent than myself, I shall wait with anxiety suited to its importance, to see whether others will take any interest in the dicussion of what has been proposed, with a sincere desire to promote the successful accomplishment of the important objects in view, namely, the profitable employment and comfortable subsistence of the working classes.

II. *A Liqueur and Jelly made from the Fruit of the Mountain-Ash.* By W. Howison, M. D., Edinburgh.—The mountain-ash, quicken or rowan tree, is very common in the northern parts of the Russian empire. It propagates itself naturally, independent of the industry of man, and is found principally upon the borders of the forest, and in the neighbourhood of the dwellings of the higher orders, as well as of the peasantry. It is greatly admired for the loveliness of its port, the luxuriance of its foliage and flowers during the summer, and for the beauty and value of its fruit during the autumn. It is also found in great abundance around the residences of foreigners settled throughout the Russian empire. The above remarks also apply to the mountain-ash throughout Great Britain; and I will now make a few observations upon the benefits which it confers upon society. Many superstitions are attached to it by the Scottish Highlanders as a protection against charms and witchcraft; a spirit is distilled from the berries; birds of the thrush kind devour them with avidity, and the mountain-ash trees placed for ornament in most parts of England are thus unfortunately stripped early in autumn of their produce. The fruit is eaten by young people; and experience has taught me, that the berries, which are of the darker red colour and most diminutive in size, are the sweetest and most agreeable to the taste. Thrust into a hay-stack for a few days until they begin to shrivel, they form no despicable morsel. In my young and happy days the garden of the Rev. Mr MacCubbin, the minister of Douglas, Lanarkshire (one of the sincerely good men which the village can boast of), produced delightful rowans, and those it was our boyish practice to conceal in his hay-stack for days before we ate them. In eating them we pressed the pulp and imbedded seeds—which in taste much resembled bitter almonds—with our teeth from the exterior covering, which we threw away. I conclude with the following receipts for making a liqueur and jelly from the ripe fruit of the mountain-ash, generally used by the natives and foreign residents settled throughout the Russian empire; and those I strongly recommend to the encouragement and protection of my fair countrywomen throughout Great Britain.

Liqueur.—To prepare this, take a small cask, fill it two-thirds full of the ripe berries picked and cleaned, then fill up the cask completely with strong spirits, and allow it to stand in a cellar for twelve months; run off the spirit and bottle it: the spirit runs off clear, impregnated with the colour and flavour of the berry. It is a very agreeable bitter, an excellent stomachic, and, when swallowed, diffuses a gentle heat over the whole system. It is much used during the intense winter of Russia, and immediately precedes the dinner. This receipt was given me by the late Commodore Hamilton, whilst in command of the Russian fleet at Ravel, and was daily used at his table.

Jelly.—To prepare this, put the berries, ripe and cleanly picked, into a large jar; place it in an oven or saucepan of boiling water, till they part with all their juice; strain the juice through a fine sieve, but do not press the berries; weigh the juice, add to it an equal weight of loaf-sugar; boil them together until the juice acquires a proper consistence. This is called Rubina Jelly. It is pleasant, with a slight bitterish taste; it is constantly eaten with roasted hare, grouse, and other game, and is the common preserve of the native Russians. This receipt was given me by Her Excellency Lady Crichton, at St Petersburg.

The Mountain-Ash is the most beautiful of the native trees of Scotland. The berries afford a dye, and are used as a bait for birds, under the name of Fowler's Berries; the bark is astringent, and is used by tanners.

III. *Fir Tops a Valuable Fuel.*—Dr Howison, lecturer on botany in Edinburgh, met with the following occurrence in Fifeshire, during one of his botanical excursions.—Calling at the cottage of a medical practitioner, a former pupil of his, he found the Esculapius going to mount his pony to visit his patients. Upon the two friends meeting, the practitioner remarked, "Doctor, it is not every day I see you; we must go in and have a *haver*." Upon entering the parlour there was no fire. He rung the bell; his housekeeper came in, carrying in her white apron a quantity of dried fir-tree tops, and a lighted candle in her hand. She threw the fir cones into the polished grate, broke a coal into pieces, and laid them over them. She then applied the candle, when almost instantaneously they broke into a beautiful strong flame, from the great quantity of turpentine they contained. They soon set fire to the coals, and in a few minutes a delightful warm fire was the result. A few blasts of the bellows might be an improvement. Next followed the decanters and glasses; and, it may perhaps be unnecessary to add, the two doctors made themselves comfortable in front of the fir-cone fire. The practitioner obtained this knowledge in the following manner:—He was attending a poor woman residing close to the forest. She could not pay him. With the gratitude of the rural population, next morning her two daughters came to his house, each carrying a sack filled with dried fir-cones collected in the wood. They told him they were for kindling a fire, and if he had no coals they would make an excellent durable fire of themselves. The cones of the Pinus Silvestris, Scots Fir, contain a great quantity of solid woody matter in addition to the resinous, and are excellently adapted for fuel. They are used over Italy, Switzerland, &c. This circumstance is little known; and the intention of these remarks is to recommend their use to the poor population of Scotland.

QUARTERLY AGRICULTURAL REPORT.

November 1842.

SURELY more glorious weather was never seen in harvest than in this season. Every operation connected with harvest from its commencement to its end, and from one end of the kingdom to the other, were got completed in the beginning of autumn without delay—without the interference of almost a single shower. The immediate effects of this condition of labour were two-fold—*beneficial* to the *farmer*, inasmuch as it enabled him to reap a good crop in an early part of the season, when the day was long, and the hours of labour many, at an ordinary rate, and to secure it in the most excellent order; and they were *injurious* to the *labourer*, inasmuch as a long day's work was obliged to be given by him at the ordinary rate of harvest wages, and his labour was so constantly in requisition, from the absence of ordinary interruptions, as materially to curtail the usual duration of harvest, so that his body was more than usually fatigued, while he received less than the usual amount of remuneration. From this cause we understand the Irish shearers have taken away with them this season much less money than they have done for many years bygone. And this is a circumstance not unworthy of consideration, when the privations of our own unemployed labourers are attempted to be alleviated during the inclemency of winter, for what has happened to the Irish must have also been felt by our own countrymen.

We hear favourable opinions expressed every where of the *fine quality* of every species of grain, wheat weighing already from 62 lb. to 64 lb., barley nearly 60 lb., and oats 45 lb. per bushel. What the produce will be per acre it is difficult to say, but every stack that has been thrashed, has yielded beyond expectation. Let the yield, therefore, be what it may, of this we are certain, that every sort of grain will be available for use in a much larger proportion to its refuse, than for many years past.

The corn markets have been much depressed on account of the gradual fall of prices since harvest, and the fall has now reached so far, 50s. per quarter, as to cause the imposition of the highest rate of import-duty that can be exacted under the new corn-bill. The importation of foreign grain has ceased for a time, not perhaps so much from any terror felt for the high import duty, as from the time of the year, when ships from the Baltic cannot be expected, for whatever may now be the rate of duty, the foreigner will meet it by reduction of price; and were the average price here permitted to regulate itself, according to the actual supply afforded by the country, and the actual price received by the farmer, the foreigner would only have to pay, and would be very glad to pay, the top duty of 20s., the price of wheat abroad, at this moment, being quoted as low as 28s. per quarter. The steadiness of price in our markets, the failure of several large houses in the corn trade, and the rate of duty, 8s., which has been paid on importation, all incline us to believe that the averages cannot now be so *easily tampered with* as they were wont under the former regulations.

The new crop of wheat has been put into the ground in the most favourable condition. In the early period of the wheat-sowing season the soil was so dry that many farmers declined sowing until rain should come, which it did, just in sufficient quantity to answer the purpose.

The potatoes were all taken up, almost without a shower; and although the yield varies in different quarters, the quality is uniformly fine, and this is a guarantee against waste. In naturally moist land the yield is good, but in light soils it is somewhat below the mark. Nevertheless, the price is moderate—not exceeding 8s. or 9s. the boll of 40 stones imperial.

The turnip crop has been very unusually affected this season. It was subjected to two kinds of ailment,—one a blight arising from a parasitic plant, the other an extensive and violent attack from an insect. It was possible for rain to wash off or otherwise destroy the insect, which it did in many instances, and the crop has been left but little injured; but no such fortunate agent could assist in destroying the parasite, and the consequence is, that the substance of the bulb in many instances has been almost exhausted. There is considerable apprehension amongst farmers of the total destruction of the turnip when frost shall come; especially of those which are springing up green in the heart; but we imagine that the greenness is rather an evidence of its safety, for it shews that vitality still exists in the bulb, notwithstanding the destruction of the leaves, and hence they will be much better able to withstand frost than those which have been already *killed* by the blight, for no other fate can be expected to overtake them but total destruction by putrefaction, unless they be used as quickly as possible. However, this is all conjecture, and time alone can shew us true results; and attention to these may afford experience for future guidance under similar circumstances.

Stock markets have experienced considerable depression this year, especially among inferior lean stock, and the result has been not unnaturally ascribed to the recent permission of the importation of foreign stock. As this is an entirely new measure, and as no one *can* in such a case foretel its *ultimate* consequences, we have determined to "sing small," and rather watch the progress of its working, than venture to predict consequences which may never be realized. Meantime, we shall collect facts, and the following table shews the amount of stock imported to 1st November instant, viz.—

Countries.	Beasts.	Cows.	Sheep.	Pigs.
Germany,	825	296	284	52
Holland,	473	165	...	622
Spain,	561	85	230	...
France,	233	...	140	...
	2092	446	654	674

making a grand total of animals imported of 3866, and about 320 a-week. The import of meat is nothing new, for it has been permitted since 1819, the duty only being lowered from 12s. to 8s. per cwt., and the only difference now is, that *fresh* as well as salted meat is permitted to be imported. We have only a remark or two to make on the subject at present. That causes exist sufficiently obvious to account for the greater part, if not the whole, of the fall in the price of stock, without calling in the aid of the tariff, however *it* may *morally* have affected the price, we firmly believe. It is well known, that all the cattle markets have been *more abundantly supplied* with stock this than last year. This is a consequence naturally to be expected from the high prices of the few years back, but, besides this, the lambing season was so very fine this year, that scarcely a lamb was lost; while last year there were thousands. This will, partly at least, account for the recently glutted lamb-fairs of the south of Scotland. It is well known to graziers, that the grass has not fattened well this summer, and this might have been expected as the effect of long drought upon a soured state of soil; the condition of stock has therefore been low, the contrary of what was the case last year. Suppose a sheep is only 1 lb. per quarter worse in condition this year, this of itself would make a difference of 2s. a-head; and the supposition is much within the mark, as may be attested by those who have regarded the comparative state of the mutton presented in the Edinburgh market this winter and last. One other remark, and we have done: if the beasts and the meat imported are so very fine in quality and condition as is represented, what is the use of our farmers laying out so much money, and bestowing so much personal trouble in supporting cattle-shows in this country, for, after all, it seems they can do no more than what foreigners *have* accomplished, without incurring any cost and trouble, namely, fatten fine beasts and kill excellent meat? Either, then, we must abandon supporting our cattle-shows, or disbelieve what is said of the fine quality of foreign stock! We decidedly vote for the latter alternative.

THE REVENUE.

***ABSTRACT** of the Nett Produce of the Revenue of Great Britain, in the Quarters and Years ended on the 5th of October* 1841, *and 5th of October* 1842,*—shewing the Increase and Decrease on each head thereof.*

	Quarters ended October 5.		Increase.	Decrease.	Years ended October 5.		Increase.	Decrease.
	1841.	1842.			1841.	1842.		
	£	£	£	£	£	£	£	£
Customs, ...	5,787,217	5,493,977	206,760	. .	19,485,217	19,656,495	171,278	. .
Excise, ...	4,160,866	3,726,035	. .	434,831	12,858,014	12,124,566	. .	733,488
Stamps, ...	1,732,704	1,631,480	. .	101,244	6,687,575	6,547,863	. .	139,712
Taxes, ...	320,160	177,437	. .	142,723	4,339,672	4,297,439	. .	62,233
Post-Office, ..	116,000	168,000	52,000	. .	426,000	591,000	165,000	. .
Miscellaneous,	65,825	33,424	. .	32,401	218,123	714,926	466,803	. .
Property Tax,	. .	313,844	313,844	. .	. .	313,844	313,844	. .
	12,182,772	11,544,197	572,604	711,199	44,064,601	44,236,133	1,116,925	935,433
	Deduct Increase,			572,604	Deduct Decrease,		935,433	
	Decrease on the Qr.			138,595	Increase on the Year,		181,492	

TABLES OF PRICES, &c.

The Average Prices of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets :—

LONDON.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1842.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Aug. 6.	58 0	27 4	18 6	35 4	33 4	33 6
13.	58 0	27 0	18 0	35 6	33 10	33 2
20.	55 11	25 10	17 10	34 6	34 6	32 7
27.	54 8	26 4	16 11	33 9	33 8	32 8
Sept. 3.	54 5	26 3	17 4	33 4	32 10	31 6
10.	53 7	25 0	16 3	32 8	33 4	34 7
17.	55 6	26 0	15 5	32 6	33 5	32 1
24.	57 10	28 0	16 7	31 8	33 2	31 11
Oct. 1.	55 6	30 9	19 1	31 4	33 10	32 6
8.	55 6	31 0	19 4	30 10	34 6	32 4
15.	54 8	31 5	17 5	30 6	34 8	31 3
22.	54 6	31 8	17 11	31 8	34 2	31 3
29.	53 9	31 3	18 6	32 2	33 8	31 5

DUBLIN.

Date.	Wheat per Bar. 20 St.	Barley per Bar. 16 St.	Bear per Bar. 17 St.	Oats per Bar 14 St.	Flour per Ba [illegible] St.
1842.	s. d.	s. d.	s. d.	s. d.	s. d
Aug. 5.	30 5	16 8	11 6	14 6	21 4
12.	29 0	15 7	11 2	13 9	21 2
19.	25 6	14 9	10 3	13 8	21 3
26.	25 0	12 10	10 4	12 3	20 1
Sept. 2.	24 2	11 0	10 0	11 1	19 8
9.	25 6	12 10	10 10	9 10	18 6
16.	25 7	14 9	10 11	10 5	18 4
23.	24 4	18 11	10 8	9 10	18 1
30.	24 3	13 6	10 9	9 6	17 8
Oct. 7.	23 5	13 0	11 3	8 9	17 4
14.	24 1	12 5	11 1	8 7	17 1
21.	23 7	12 3	11 3	8 3	17 0
28.	24 3	11 6	10 3	8 1	16 9

LIVERPOOL.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1842.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Aug. 6.	51 2	29 2	20 10	34 6	34 10	36 6
13.	53 9	29 4	20 9	34 2	34 6	36 0
20	48 5	29 6	20 8	33 6	34 5	35 10
27.	47 9	28 6	18 2	32 10	33 4	34 6
Sept. 3.	50 1	28 10	18 6	32 6	33 1	31 7
10.	50 0	25 6	18 0	32 4	32 8	31 8
17.	51 7	26 0	19 10	32 8	33 6	36 11
24.	50 4	25 6	19 4	33 2	33 4	37 1
Oct. 1.	46 5	25 0	18 6	33 6	34 2	35 7
8.	43 10	24 7	20 0	33 10	34 6	34 7
15.	43 10	28 6	17 8	34 6	34 8	36 3
22.	43 1	29 4	17 1	34 2	33 10	34 9
29.	43 3	28 10	17 4	33 8	33 6	33 8

EDINBURGH.

Date.	Wheat.	Barley.	Oats.	Pease.	Beans
1842.	s. d.	s. d.	s. d.	s. d.	s. d.
Aug. 3.	60 6	33 6	25 0	34 0	34 6
10.	60 0	32 0	24 6	33 9	34 2
17.	59 6	31 6	24 0	33 10	34 10
24.	59 4	29 6	22 6	33 2	33 10
31.	58 0	28 0	22 4	33 0	33 8
Sept. 7.	60 0	27 10	20 0	32 6	33 6
14.	58 4	28 2	21 4	33 4	33 10
21.	57 0	29 0	22 0	34 2	35 6
28.	55 7	30 3	20 9	34 6	35 5
Oct. 5.	56 2	30 0	20 4	34 0	34 6
12.	54 6	29 8	20 2	33 6	34 8
19.	57 0	29 0	21 0	34 6	36 2
26.	55 1	29 6	22 8	34 6	35 2

TABLE shewing the Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. IV. c. 58, and 5th Vict. ch. 14, and the Aggregate Averages which regulate the Duties payable on FOREIGN CORN: the Duties payable thereon, from August 1842 to October 1842.

Date.	Wheat.			Barley.			Oats.			Rye.			Pease.			Beans.		
	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.
1842.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d
Aug. 6.	61 3	64 2	8 0	27 6	29 9	9 0	20 6	21 8	6 0	35 6	34 7	9 6	32 11	34 4	8 6	34 1	34 9	8 [illegible]
13.	58 11	63 3	9 0	27 6	27 8	9 0	20 2	21 3	6 0	35 6	35 1	7 6	34 7	34 2	8 6	34 2	34 7	8 [illegible]
20.	56 4	61 10	11 0	26 9	27 7	9 0	19 5	20 10	6 0	32 9	35 8	7 6	33 11	34 2	8 6	33 8	34 5	8 6
27.	55 0	60 1	12 0	27 3	27 6	9 0	18 7	20 3	6 0	31 6	34 6	8 6	32 6	33 8	9 6	33 11	34 3	8 [illegible]
Sept. 3.	53 3	58 1	14 0	27 2	27 4	9 0	18 9	19 10	7 0	31 5	33 8	9 6	32 5	33 4	9 6	33 1	33 11	9 [illegible]
10.	51 6	56 0	16 0	27 2	27 3	9 0	18 6	19 4	7 0	29 4	32 9	10 6	33 6	33 4	9 6	33 5	33 9	9 [illegible]
17.	52 8	54 7	18 0	27 2	27 2	9 0	17 8	18 10	8 0	29 10	31 9	10 6	32 11	33 4	9 6	32 10	33 6	9 [illegible]
24.	54 0	53 10	18 0	27 10	27 2	9 0	18 4	18 7	8 0	29 10	30 9	10 6	33 3	33 1	9 6	33 0	33 4	9 [illegible]
Oct. 1.	53 2	53 3	18 0	28 5	27 6	9 0	18 6	18 5	8 0	31 0	30 6	10 6	33 7	33 0	9 6	33 4	33 4	9 [illegible]
8.	51 6	52 8	18 0	28 8	27 9	9 0	18 6	18 5	8 0	30 0	30 3	10 6	33 10	33 2	9 6	33 0	33 2	9 [illegible]
15.	51 1	52 4	18 0	28 10	28 0	9 0	18 0	18 3	8 0	31 7	30 8	10 6	33 3	33 5	9 6	32 4	33 0	9 [illegible]
22.	50 9	52 2	18 0	28 11	28 4	9 0	18 1	18 2	8 0	32 7	30 10	10 6	33 10	33 5	9 6	32 2	32 10	10 [illegible]
29.	49 5	51 8	19 0	28 4	28 6	9 0	18 5	18 4	8 0	31 7	31 1	10 6	33 7	33 7	9 6	32 2	32 8	10 6

The ***MONTHLY RETURNS****, published in terms of 9th Geo. IV. c. 60, shewing the Quantities of Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; the Quantities upon which duties have been paid for home-consumption, during the same Month; and the Quantities remaining in Warehouse at the close thereof, from 5th August 1842 to 5th October 1842.*

Month ending	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN WAREHOUSE.		
	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.
Aug. 5. 1842.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, . .	386,736 5	3,923 0	390,679 5	282,174 0	3,923 0	286,097 0	1,259,991 4	459 3	1,260,450 7
Barley, . .	9,328 1	. .	9,308 1	9,313 7	. .	9,313 7	89,192 0	. .	89,192 0
Oats, . . .	119,781 3	. .	119,781 3	92,572 1	. .	92,572 1	140,411 7	. .	140,411 7
Rye, ...	1,998 2	. .	1,998 2	18 4	. .	18 4	4,565 5	. .	4,565 5
Pease, . . .	6,089 1	6,491 6	12,580 7	1,665 4	7,309 6	8,975 2	46,787 6	388 1	47,175 7
Beans, . .	7,066 4	. .	7,066 4	1,235 3	. .	1,235 3	69,362 5	. .	69,362 5
Totals,	531,020 0	10,414 6	541,444 6	387,009 3	11,232 6	398,242 1	1,601,311 3	847 4	1,602,158 7
Sept. 5. 1842.									
Wheat, . .	811,377 6	8,496 6	819,876 4	2,086,846 7	8,498 6	2,095,345 5	5,305 4	467 1	5,772 5
Barley, . .	17,682 2	27 3	17,689 5	15,327 3	27 3	15,354 6	81,266 4	. .	81,266 4
Oats, . . .	86,327 6	289 5	86,617 3	93,944 2	289 5	94,233 7	130,856 7	. .	130,856 7
Rye, ...	1,121 6	. .	1,121 6	2,774 2	. .	2,774 2	1,368 3	. .	1,368 3
Pease, . . .	19,570 7	6,872 4	26,443 3	41,340 6	6,872 4	48,213 2	25,914 5	388 1	26,302 6
Beans, . . .	18,433 7	. .	18,434 7	6,236 5	. .	6,236 5	79,169 3	. .	79,169 3
Totals,	951,517 2	15,686 2	970,185 4	2,216,350 1	15,688 2	2,262,158 3	323,881 2	855 2	324,736 4
Oct. 5. 1842.									
Wheat, . .	128,040 0	1,035 3	129,075 3	58,466 1	1,035 3	59,501 4	64,135 3	410 3	64,545 6
Barley, . .	8,862 0	. .	8,862 0	8,902 6	. .	8,902 6	79,431 2	. .	79,431 2
Oats, . . .	34,111 2	420 0	34,531 2	75,547 3	420 0	75,967 3	80,201 3	. .	80,201 3
Rye, ...	931 1	. .	931 1	18 0	. .	18 0	2,176 4	. .	2,176 4
Pease, . . .	15,700 4	1,262 6	16,963 2	4,701 5	1,262 6	5,964 3	35,847 1	388 1	36,235 2
Beans, . .	6,052 2	. .	6,829 2	19,801 2	172 2	19,801 2	71,333 1	. .	71,333 1
Totals,	193,697 1	2,718 1	197,192 2	167,337 1	2,890 3	170,255 2	333,124 6	798 4	333,923 2
Aug. 5. 1842.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
Flour, . . .	58,980 3 15	97,978 2 6	156,959 1 21	101,364 1 21	96,152 2 6	197,716 2 8	261,389 0 17	11,700 0 5	273,089 0 22
Oatmeal, .	1 3 0	1,909 3 17	1,911 2 17	1 3 0	2,134 1 21	2,136 0 21	20 3 18	701 2 25	722 2 15
Totals,	58,982 2 15	99,888 1 23	158,871 0 10	101,366 0 21	98,286 3 21	199,849 3 1	261,410 0 7	12,401 3 2	273,811 3 9
Sept. 5. 1842.									
Flour, . . .	92,744 3 22	149,290 2 24	242,035 2 18	341,781 3 0	156,321 1 18	498,103 0 18	5,816 0 14	4,757 0 11	10,573 0 25
Oatmeal, .	201 0 12	6,073 3 1	6,274 3 13	. .	6,434 1 25	6,434 1 25	150 3 22	341 0 1	491 3 23
Totals,	92,946 0 6	155,364 1 25	248,310 2 3	341,781 3 0	162,755 3 15	504,537 2 15	5,967 0 8	5,098 0 12	11,065 0 20
Oct. 5. 1842.									
Flour, . . .	25,722 0 26	73,849 1 13	99,571 2 11	1,569 0 21	71,037 3 3	72,606 3 24	35,840 0 27	7,187 0 5	43,027 1 4
Oatmeal, .	4 1 12	5,962 1 7	5,966 2 19	20 1 9	5,777 1 20	5,797 3 1	22 1 16	638 3 16	661 1 4
Totals,	25,726 2 10	79,811 2 20	105,538 1 2	1,589 2 2	76,815 0 23	78,404 2 27	35,862 2 15	7,825 3 21	43,688 2

PRICES of BUTCHER-MEAT.

	LONDON, *Per Stone of 14 lb.*		MORPETH, *Per Stone of 14 lb.*		EDINBURGH, *Per Stone of 14 lb.*		GLASGOW, *Per Stone of 14 lb.*	
Date.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
1842.								
Aug.	7/6 to 7/9	7/6 to 8/	7/6 to 7/9	7/3 to 7/6	7/3 to 7/6	7/ to 7/6	7/3 to 7/6	7/3 to 7/9
Sept.	7/3 7/9	7/3 7/9	7/3 7/6	7/ 7/6	7/ 7/3	7/ 7/3	7/3 7/6	7/3 7/6
Oct.	7/ 7/6	7/3 7/6	7/ 7/3	7/ 7/6	7/ 7/3	6/9 7/3	6/3 7/3	6/9 7/3

PRICES of English and Scotch WOOL.

ENGLISH, per 14 lb.		
Merino, ...	14/6 to	17/
in grease . . .	12/	14/6
South Down, . .	13/	15/6
Half Bred, . . .	11/6	13/
Leicester, Hogg . .	14/	17/6
Ewe and Hogg, . .	12/	14/
Locks, ...	6/	7/
Moor, . . .	5/	6/

SCOTCH, per 14 lb.		
Leicester, Hogg, . .	13/6 to	16/6
Ewe and Hogg, . .	12/	13/6
Cheviot, white, . . .	11/6	14/
Laid, washed, . .	8/2	10/
unwashed, . .	6/3	7/
Moor, white, . . .	6/2	7/
Laid, washed, . . .	5/	6/
unwashed	4/	5/

THE

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ON THE FOREST AND OTHER TREES OF ABERDEENSHIRE.

By G. Dickie, M.D., Lecturer on Botany in the University and King's College of Aberdeen.

In the Aberdeen Flora, published a few years ago, some remarks were introduced respecting the general features of the vegetation in the vicinity of Aberdeen; these chiefly had reference to the smaller wild plants, trees of natural growth being rare, and of inconsiderable dimensions in the lower parts of the county. Since that time my attention has been directed to the vegetation in other parts of Aberdeenshire, and in some of these, the trees of natural growth occupy a very prominent feature, and cover extensive tracts. Believing that some account of these, as well as of planted trees, whether indigenous or exotic, might, in the mean time, be interesting, and feeling conscious that the exertions of any single individual would be unequal to the labour of procuring the information wished for, a circular was addressed to gardeners, foresters, and others, in different parts of the county. A considerable number of reports was received, the results of which are embodied in the following remarks.

Several circumstances tend to diminish the value of such inquiries, and to render vague any useful inferences which might be deduced from them: for instance, no information was received of the attention which had been paid to the proper pruning and thinning of the trees. This omission was probably owing chiefly to a deficiency in the original circular, although at the same time it is probable (if I may judge from the fulness of some of the reports), that if any particular method of pruning had been adopted at any of the places afterwards mentioned, such would have been alluded to. The importance of attending to this is evident, from Mr Cree's method of pruning, recorded in Loudon's Horticultural Journal for January 1842. He has found, by experiment, that all trees (excepting the Fir tribe, for which his method is not adapted) under 18 feet in height, and 15 inches in circumference, advance at an average as much in height and circumference in six years, if the branches are properly shortened, as they do in fifteen years, if they are not shortened, or if the trees are improperly pruned. In very few instances was it stated, whether the trees were of natural growth, or had been planted; this in some cases is of considerable importance, especially as regards the Fir tribe, which are generally admitted to receive a check from the operation of transplanting. Independently, however, of these deficiencies, it is at least of some interest to be aware, that Aberdeenshire can produce such trees as are recorded in the following tables; and if any apology is necessary, I may take shelter under the high authority of M. De Candolle, who remarks,—"The longevity of trees is truly interesting, were it merely from motives of curiosity. If we prize every document of antiquity, why should we not attach a higher degree of importance to know whether such a tree be the contemporary of the oldest generations? In certain cases this knowledge might throw light on the history of monuments, as that of monuments on the history of trees in their vicinity. . . . . If we reflect on the means of obtaining a solution of our question, we shall see that they are all founded on a more exact appreciation of the ordinary laws of the growth of trees, and that this direct knowledge may throw light on many parts of vegetable Physiology, and the art of Forestry. I therefore believe, that these inquiries may turn out to be useful; but were they merely curious, I would still think that they might not be unworthy of being presented to the public."—(Ed. Phil. Jour. 1833.)

I cannot omit this opportunity of stating my obligations to the gardeners, foresters, and others, who transmitted reports from the different places afterwards mentioned.

The measurements of the girth were recommended to be made at the surface of the ground, and at four feet from it. In some cases the former situation cannot be considered to yield such satisfactory results as the other. This is especially true respecting the spruce-fir, beech, and some others, whose trunks at that part seem frequently as if composed of several columns united into one; at four feet, on the contrary, the trunk is usually free from protuberances, and of an average thickness. Measurements of, at least, three of the largest of each kind of tree were requested, and, in most cases, received; it was, however, considered unnecessary, in general, to record here more than the largest.

Since climate exercises so great an influence over vegetation, it may not be improper to introduce here a few of the results of meteorological registers, made in different parts of the county. The mean temperature at Aberdeen, from nineteen years' observations by the late Mr Innes, is 47°.1, agreeing nearly with the results obtained by observations on the temperature of some of our best springs. The mean temperature at Buchanness Lighthouse, from registers for 1834–5–6, is 47°.3. The mean temperature at Alford, 26 miles inland, and 420 feet above the sea, is 45°.03, from observations during 1833 to 1841 inclusive. The mean temperature at Huntly Lodge, 30 miles inland, for the year 1830, was 45°.04; the water of a deep well, and of an open spring at the same place, and during the same period, afforded 45°.4 and 45°.6 respectively; the observations made at that place, however, have been continued for several years, and may probably yield a result different from the one recorded, to which alone I have access. It may be stated generally, there are exceptions; that, in this latitude, the mean of the three summer months is about 10° higher than that of the whole year; and the mean of winter as much below; the mean of autumn being one or two degrees higher, and that of spring one or two lower than the annual mean. Occasionally, and especially inland, the temperature falls very low; for instance, in the statistical account of the parish of Tullynessle, in the winter of 1837, it is stated that the thermometer indicated 12° below zero; and at Aberdeen, on the 9th January 1841, the lowest was + 3°.4. The results obtained by rain-gauges being so liable to fallacy, it is needless to record such in this place; neither shall I allude to the results obtained by readings of the barometer, since the effect produced at low elevations, by the varying pressure of the atmosphere, is still very obscure.

CONIFERÆ.—The Fir tribe.—*Pinus sylvestris.*—The Scotch Fir. Captain S. E. Cook, in an interesting paper, in the second volume of the Annals of Natural History, states that the *Pinus Cembra* and *P. uncinata*, are the only European species which live at a higher elevation than the Scotch fir. Its distribution through Aberdeenshire is very general, occurring near the sea level, and reaching an elevation of 2000 to 2300 feet. It is for the most part planted in the low grounds, where it never attains any great size; and it is only in the forests of Mar and Balachbuie where we meet with it in a state of nature, and frequently attaining large dimensions. The abundant remains of this species found in peat mosses, in different parts of the country, shew that there must have existed extensive forests where no trees now grow.

In the reports which were received, no distinction is made between the two varieties of this species, which are admitted by some botanists; and so far as my own observation entitles me to express my opinion, I believe that the redder colour of the wood in Mr Don's variety *Montana*, is merely accidental, owing to difference of soil and climate; for examples occur in the lower grounds, of trees of this species yielding a pale wood, which is stated to be equally dense and valuable with that of the former. Some of the bog-timber of Ireland has been believed to be the remains of *Pinus mughus* (a species certainly nearly allied to *P. sylvestris*), the cones of which have been found in the peat of that country.

TABLE I.—*Pinus sylvestris.* THE SCOTCH FIR.

Girth at the soil.		Girth at 4 feet.		AGE.	SOIL.	LOCALITY, &c.
Ft.	in.	Ft.	in.	Years.		
6	4	5	6	95	Sand on gravel.	Parkhill.
7	9	6	3	120 ?	Gravel on gneiss.	Seaton.
6	4	5	9	.	. . .	Den of Rubislaw.
4	4	3	10	46	Peat and sand.	Philorth.
5	9	4	9	100	Clay bottom.	Pitfour.
3	9	3	5	40	... ...	Kinmundy.
8	2	7	6	90	Subsoil, gravel.	Strichen.
8	3	7	9	100	Black loam on clay.	Echt.
		6	0	.	. . .	Kemnay.
10	0	7	6	90 ?	. . .	Crathes.
7	2	.	.	.	. . .	Glassel.
8	6	5	8	.	Thin gravel on clay bottom.	Tonley.
7	4	6	0	100	Light mould on hard gravel.	Wardhouse.
4	3	3	0	40	... ...	Do.
9	0	8	2	95	Kindly soil on rock.	Leith Hall.
6	10	6	2	.	Alluvial on clay and gravel.	Haughton.
7	0	6	0	70	Poor soil.	Breda.
10	2	8	2	97	. . .	Whitehaugh.
7	4	7	0	70	Rich clay loam.	Huntly Lodge.
7	6	7	0	85	Black surface, yellow bottom.	Newe.
6	9	5	8	70	Sandy loam, gravel bottom.	Ballater.
6	3	5	2		. . .	Birkhall.
11	9	7	8		. . .	Abergeldie.
23	0	10 9	3 twins 3 at 6 ft.	180 to 300 ?	Open gravel soil.	Invercauld (natural fir).
16	3	11	4			
9	0	6	10	80	... .	Do. (planted fir).
22	4	13	7	.	. . .	Mar forest (est. cub. contents = 250 ft.).
19	6	12	10	.	. . .	Do. (do. do. = 120 ft.).
19	0	12	0	.	. . .	Do. (do. do. = 220 ft.).
17	9	11	9	.	. . .	Do. (do. do. = 130 ft.).
17	4	13	0	.	. . .	Do. (do. do. = 190 ft.).
17	4	11	2	.	. . .	Do. (do. do. = 160 ft.).
16	0	11	0	.	. . .	Do. (do. do. = 140 ft.).
17	6	10	8	200 ?	North exposure, soil gravel.	Aboyne (natural firs).
14	0	12	2	...	... ...	... ...
13	8	8	8	...	... ...	... ...
11	10	8	0	120	South exposure, rich alluvial soil.	... (planted fir).
12	2	6 5	2 twins 6 at 4 ft.	90 ?	... ...	... ...
8	8	7	2	...	... ...	... ...
8	9	7	0	...	... ...	... ...

As it is of some importance to study the relative development of the annual zones in sections at the base of the tree, the following notes may be of interest. The zones having been measured by a common tape-line, and the largest side selected, the pith being often eccentric, it must not be expected that the measurements thus taken can correspond precisely with those of the circumference; the thickness of the bark also, was not usually noted; still these rough notes will give a tolerable idea of the rate of growth :—

Firs in the Forest of Balachbuie, 120 *annual zones in each.*

No. I.—Girth, 7 feet 8 inches.

Zones 1 to 20 = 2. inches.
... 20 to 30 = 2.25.
... 30 to 40 = 3.
... 40 to 50 = 2.
... 50 to 60 = 2.25.
... 60 to 120 = 5.

No. 2.—Girth, = 8 feet.

Zones 1 to 20 = 1. inches.
... 20 to 30 = 1.5.
... 30 to 40 = 2.25.
... 40 to 50 = 1.75.
... 50 to 60 = 1.
... 60 to 70 = 1.5.
... 70 to 120 = 3.

No. 3, of very irregular outline.

Zones 1 to 10 = 0.5. inches.
... 10 to 20 = 0.75.
... 20 to 30 = 1.5.
... 30 to 40 = 2.5.
... 40 to 50 = 2.
... 50 to 60 = 1.
... 60 to 70 = 0.75.
... 70 to 80 = 0.5.
... 80 to 120 = 1.5.

Firs in Forest of Glen Tanner.

No. 1.—80 zones; girth,= 5 feet 5 inches.

Zones 1 to 20 = 1.25. inches.
... 20 to 30 = 1.5.

No. 2.—83 zones; girth, = 5 feet 7 inches.

Zones 1 to 20 = 0.75. inches.
... 20 to 30 = 1.25.
... 30 to 40 = 1.25.

No. 3.—80 zones; girth, = 4 feet.

Zones 1 to 10 = 0.5. inches.
... 10 to 20 = 1.
... 20 to 30 = 1.12.

A section of one at Pannanich shewed 65 zones, and its girth at the soil was 3 feet 5 inches. Seven trees at Abergeldie, each having 60 zones, measured respectively (girth at the soil) 4 feet,—3 ft. 10 in., 3 ft. 8 in., 4 ft. 3 in., 3 ft. 6 in., 3 ft. 11 in., and 3 ft. 10 in.

A tree of this species in the Dry Den, near Aberdeen, shewed 70 zones; its girth at the soil was 3 feet 8 inches.

Zones 1 to 20 = 2.25. inches.
... 20 to 30 = 1.12.
... 30 to 40 = 0.75.
... 40 to 50 = 0.5.
... 50 to 70 = 0.75.

From the reports received, the following may be considered the average annual increase at different periods:—From six trees at Kinmundy and Wardhouse, 40 years old, 3.4 and 4.8 lines respectively, giving a mean of 4.1 lines;* five trees at Breda and Huntly Lodge, 70 years old, 4.1 and 4.5 respectively, giving a mean of 4.3 lines; three trees, 90 years old, at Strichen, give a mean of 3.9 lines; nine trees at Pitfour, Echt, and Wardhouse, 100 years old, afford respectively 2.4, 3.2, and 2.7 lines, the mean being 2.76 lines; two trees in the forest of Balachbuie, 120 years, give a mean of 2.9 lines. These results have reference to the diameter at the *thickest part*. On the supposition that the correct ages of the trees were stated, it would seem that the growth continues steady up to 70 years, diminishing from that period to 90; the examples at Balachbuie are no doubt very favourable, and hence the increase shewn by them can scarcely be considered as generally happening. It must also be kept in view, that the trees measured were the largest at each place, and that the results would differ materially were the calculations made from a number of trees shewing the extremes (highest and lowest) at the same age in the same place.

In the report of natural firs in Invercauld forest, the age was reported from 180 to 300 years, and girths of 10 trees were given, the largest being that in the accompanying table, and the smallest 8 feet 9 inches at the soil, and 7 feet in girth at 4 feet. The mean annual increase calculated from these ten trees, and assuming them to be 180 years old, would be 3.3 lines. There can be little doubt that the largest of these far exceeds 300 years, as from 100 to 120 years, the annual zones in the sections above recorded were so small that it was very difficult to trace them. The forester at Invercauld states, that "the second tree of natural fir in Table I. at 25 feet from the soil, measures 7 feet 3 inches girth, the solid timber in it being 160 feet. Another measuring at the soil 9 feet 6 inches, at 4 feet, 8 feet 2 inches, and at 27 feet, 6 feet 9 inches, contains of solid timber 150 feet. Another at the surface of the soil is 8 feet 9 inches; at 4 feet 7 feet; at 16 feet it is 6 feet 2 inches, with a clean trunk to the height of from 40 to 50 feet, and shooting up to the entire height of 70 to 80 feet. This small tree is only a specimen of hundreds of trees of the same size around it." Mr Cumming of Allanaquoich, to whom I am indebted for measurements of 28 of the largest trees in Mar forest, says, "Most of them are supposed to be from 200 to 300 years old; some of them probably more. The cleanest and straightest grown trees are generally found on the north sides of the hills; the most branched, and, when cut up, the most knotty, on the south side. The south side of the tree is also, for the most part, the most branched, and the north side least. It is also to be remarked, that wherever tall clean trees are to be found, it is either when they still stand comparatively close to each other, or when the ground bears evident marks of their having done so at some period. Generally speaking, in very old trees, those having fine smooth bark are the most likely to be rotten in the heart; but the quality of such portions as are not affected with rot, is finer than that with rough bark." In the 7th volume of the Transactions of the Highland Society, it is stated, that three trees from Mar forest, one of which had been felled for three years, another one year, and the third eight months, were tested at Woolwich. Each of these three trees was about 28 inches in diameter at the root, and contained 50 feet in length of serviceable timber, the grain remarkably clean, free from knots and full of turpentine; and from the results it appeared, that their strength exceeded that of any other fir submitted to experiment, although a specimen of Riga was selected from a tree supposed to be of superior quality, on purpose to form a comparison. The forest of Mar, from which these were brought, is the property of the Earl of Fife, contains upwards of 60,000 trees of the above description (the results of these trials were published in 1817), besides an immense number of less dimensions, fit for various purposes.

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* A line is $\frac{1}{12}$th of an inch.

Mr Mortimer, wood-merchant here, informs me, that the best planted trees of this species occur at Aboyne; they range from 80 to 100 years of age; many of them contain from 30 to 40 cubic feet; and of those on the Newhill, at the same place, several have from 40 to 80.

A remarkable distortion of the trunks of the Scotch fir may frequently be seen in different districts; the stems present the most fantastic shapes, and the letter S represents a form frequently assumed; the trees are evidently not in a thriving condition, owing, no doubt, to this distortion. This effect is well known to be produced by the drifting of snow upon the trees when young, and while their stems are still slender and flexible. Examples of this occur at Scotston and Hazelhead, near Aberdeen, and at Achernach, in Strathdon; and it is probably common in other places.

Larix Europæa.—The Larch. This valuable tree is now very general in Aberdeenshire, occurring from the sea level to 1800 feet; this last is the greatest altitude at which I have seen it in this county; it had evidently been some years planted, but was not thriving; the plants formed low-stunted bushes. In the 4th volume of the Horticultural Transactions, it is stated by the Duke of Athole, that in mountainous tracts of this country, at an elevation of 1500 to 1600 feet, the larch, at eighty years of age, has arrived at a size to produce 300 cubic feet. Captain S. E. Cook (*loc. cit.*) says, that it is spread from the S. Alps to Siberia, but never grows naturally at a low level, excepting far to the north. The most southern site known to him is in the high Apennines, near their junction with the Alps in Piedmont, where there are vast and almost inaccessible forests of trees of the largest dimensions. It is common in the highest Piedmontese Alps, around Mont Rosa and Mont Blanc; and in ascending the great St Bernard, is seen far above every other tree. Authors tell us that a certain elevation of surface, coldness of climate, and inferiority of soil, are necessary to produce its timber in perfection. The accuracy of this seems doubtful.

TABLE II.—*Larix europæa.* THE LARCH.

Girth at the soil.	Girth at 4 Feet.	AGE.	SOIL.	LOCALITY.
Ft. in.	Ft. in.	Years.		
4 8	3 5	.	. . . .	Den of Rubislaw.
6 0	5 0	.	. . . .	Dry Den.
6 0	5 0	60	Clay bottom.	Aden.
4 6	3 0	45	Light loam, rocky bottom.	Kinmundy.
8 4	7 10	80 ?	Clay subsoil.	Strichen.
7 0	5 6	.	Sandy soil.	Cluny.
8 10	. .	.	. . . .	Glassel.
11 6	8 6	90 ?	. . . .	Crathes.
11 8	6 9	60	Red gravel, clay bottom.	Tonley.
6 0	4 1	35	Wet surface, gravel bottom.	Wardhouse.
4 10	3 6	32	Thin poor soil, gravel bottom.	Do.
3 0	2 2	34	Thin black mould on hard bottom	Do. (upwards of 1000 feet above sea level).
9 3	8 1	67	Clay soil on gravel.	Leith Hall.
6 10	5 2	55	Strong loam.	Do.
11 8	8 6	70	. . . .	Breda.
	7 9	70	. . . .	Kemnay.
3 4	3 0	28	Black surface, yellow bottom.	Newe.
8 0	7 2	90	... ...	Edinglassie.
8 4	6 5	70	Light sand, gravel bottom.	Ballater.
8 8	6 0	.	. . . .	Birkhall.
10 9	6 1	.	. . . .	Abergeldie.
13 0	8 4	80 ?	Rich gravel.	Invercauld.
4 9	3 3	50 ?	. . . .	Altguisach.
5 10	4 0	.	. . . .	Corymulzie.
10 4	7 0	.	. . . .	Mar Lodge Garden.
10 3	10 1	.	. . . .	Do. Do.
10 6	7 6	75	Sharp soil, gravel subsoil.	Aboyne.
9 6	7 10	.	... ...	"
9 3	8 7	.	... ...	"
8 3	6 5	43	... ...	"

A section of a larch at Tonley had 41 zones, and its girth at the soil was 5 feet 7 inches; the breadth from the pith to the bark, on the east side, was nearly 12 inches, the pith being nearest the west side.

Zones 1 to 10 = 1.5. inches.
... 10 to 20 = 3.
... 20 to 30 = 2.8.
... 30 to 40 = 4.
... 40 to 41 = 0.5.

Another in the same place had 53 zones, and measured (exclusive of the bark) 5 feet 6 inches at the thickest part

Zones 1 to 10 = 3. inches.
... 10 to 20 = 3.
... 20 to 30 = 1.75.
... 30 to 40 = 2.
... 40 to 50 = 1.

The average annual increase (at the thickest part), at different periods, is as follows :

34 years = 3.8 lines (3 trees at Wardhouse).
35 ...... = 6.6 ... (3 do. do.).
45 ...... = 3.9 ... (3 trees at Kinmundy).
60 ...... = 3.9 ... (3 at Aden).
... . = 7.5 ... (3 at Tonley).
70 ...... = 7.01 ... (3 at Breda).
80 ...... = 6.9 ... (3 at Invercauld).

As it is well known that the larch is of very rapid and steady growth, it seems very evident that the trees in the above table, of 34, 45, and 60 years, are not in a thriving condition. Exclusive, therefore, of these, the others shew that the increase of the larch continues steady to a considerable age ; at the same time it may be stated, that the comparison would have been more valuable if it had been possible to compare trees of different ages, growing in the same place and similar soil.

Sir Henry Steuart, in his essay on Planting, observes, " To those acquainted with the rapid progress made by the larch, on a gravel soil on which any tolerable quantity of vegetable mould has been aggregated, it is a fact well known, that it doubles its value every *three years* after fifteen years old, and every *five years* after twenty-five years." The gardener at Finzean reports, that he measured some trees, each containing 30 cubic feet, not above 48 years old, and of excellent, quality. It will be evident, from the large dimensions of some of the trees in Table II., that there are many localities in Aberdeenshire admirably suited to the growth of the larch. In the statistical account of the parish of Monymusk, it is stated that at the old garden of Paradise, there are larches upwards of 100 years old, several of which measure from 10 to 11 feet in circumference at the lower part of the trunk, and were found in 1826 to be from 90 to 103 feet of extreme height, and to contain from 170 to 190 cubic feet of timber. Some of our best Aberdeenshire larches fall little short of those at Monzie, Dupplin, and Dunkeld, mentioned in Loudon's Magazine, May 1842, their age and other circumstances being considered. Mr Campbell, wood-merchant here, informs me that larch-timber, of Aberdeenshire growth, is of very fine quality, the market price ranging from 18d. to 20d., and in the forest 1s. per foot.

It is well known that the larch is very liable to fail, owing to at least three causes,—1*st*, The attacks of insects, *Eriosoma laricis* and others; 2*d*, decay in the centre, usually called *pumping;* and, 3*d*, *sloughing* of the bark. In addition to these, there cannot be a doubt that, in certain situations, the leading shoot is liable to be hurt by the frosts, which often happen in August and September. Some reports were forwarded on this important subject, and may be inserted here.

"At Echt larches do not thrive; an insect gets into the young growths after ten or fifteen years, and the trees die." The gardener at Wardhouse alludes to the disease, which he calls blisters, "which form from two to three feet from the ground; they are produced on two sides of the tree alternately, until they reach the top, when the tree dies." He also states, that about two acres had been planted with larches after a crop of Scotch firs. About two years ago ten of these trees (thirty years old) were cut down, and of these three were from four to eight feet up the tree in a state of decay, with a number of small white spots, spreading along the interior of the tree, and destruction rapidly following them. These trees had a healthy appearance; they grew on a poor thin soil with a gravel bottom. At Tonley, "the best larches are uniformly to be found in well-sheltered dens; on land which has been formerly cultivated they spring up rapidly, but in deep mould, when rooted up by the wind, shew rotten roots, and the trunk is often decayed in the centre."

In the vicinity of Aberdeen instances of this disease have also occurred, as at Den of Rubislaw and Scotston. The gardener at this last place states, that the decay usually commences in one or more of the principal divisions of the root, and that it spreads from them to the centre of the trunk. "About Keith Hall the larch trees are all dead; it cannot be the soil nor age which has produced this, for they are all the same, although in different soils and of different ages, the cause seems to have been the hard frost in 1838, for they have all been in a state of decay ever since."

In exposed situations it will be often observed that the leading shoot of young larches has been destroyed, and another has sprung from the side of the decayed remains of the first. In some cases this has been repeated more than once, in consequence of which the trees have assumed a distorted appearance; this effect is usually, and probably with justice, attributed to the action of frost upon the young leading shoot, while still green and full of sap.

Abies excelsa.—The Spruce Fir. This species has been rather generally planted in Aberdeenshire; there are many thriving examples of it near the sea level, but I have not observed the absolute highest altitude attained by it. There are, however, good trees of this species at Altguisach, near Loch Muich, at an elevation of 1400 feet; and some fine examples at Invercauld, probably reaching 1200 feet.

Captain S. E. Cook ranks it as the first in hardiness belonging to the genus. It ranges from Lapland to Savoy, south of which it is not found in the natural state. It would appear to live farther north than the *Pinus sylvestris*, its only neighbour in the north of Scandinavia; but it is, he says, possible, that dampness of soil, which it resists better than any of the tribe, may be the cause of this apparent greater degree of hardiness.

TABLE III.—*Abies excelsa.* THE SPRUCE FIR.

Girth at the Soil.	Girth at 4 Feet.	AGE.	SOIL.	LOCALITY.
Ft. in.	Ft. in.	Years.		
7 4	5 4	. .	. . . .	Dry Den, near Aberdeen.
3 0	. .	38 zones.	. . . .	Do.
4 11	4 3	46	Heathy sandy soil.	Philorth.
5 6	4 6	100	Clay bottom.	Pitfour.
4 6	4 3	50	Clay bottom.	Aden.
4 0	3 4	45	Light loam, on rocky bottom.	Kinmundy.
6 10	6 4	100	Deep black mould, on clay.	Strichen.
7 2	6 5	100	Thin soil, on clay.	Echt.
8 0	5 6	.	. . . .	Cluny.
	5 11	.	Peat.	Kemnay.
7 4	. .	.	. . . .	Glassel.
9 4	6 10	60	Gravel, on clay bottom.	Tonley.
6 3	4 7	100	Light mould, on gravel.	Wardhouse.
5 0	4 2	40	Sharp light soil, on hard bottom.	Do.
8 10	6 3	67	Good soil, on rock and gravel.	Leith Hall.
8 0	5 4	70	Poor soil.	Breda.
14 6	10 6	97	. . . .	Whitehaugh.
4 8	4 4	28	Black surface, yellow bottom.	Newe.
10 0	8 4	90	... ...	Edinglassie.
6 4	4 10	70	Light sandy loam, on gravel.	Ballater.
8 0	6 4	.	. . . .	Abergeldie.
20 0	9 0	75	Rich gravel.	Invercauld.
12 6	8 5	80	Good shelter, in rich soil.	Aboyne.
11 0	9 6	"	... ...	...
8 9	6 6	"	... ...	...

The following results shew the average annual increase at different ages.

28 years	=	6.9 lines	(3 trees at Newe.)
40 ...	=	5.2 ...	(3 at Wardhouse.)
45 ...	=	3.2 ...	(3 at Kinmundy.)
50 ...	=	3.07 ...	(3 at Aden.)
60 ...	=	6.3 ...	(5 at Tonley.)
70 ...	=	3.9 ...	(3 at Ballater.
90 ...	=	4.3 ...	(3 at Edinglassie.)
100 ...	=	2.1 ...	(3 at Pitfour.)
... ...	=	2.9 ...	(3 at Strichen.)
... ...	=	2.9 ...	(3 at Echt.)
... ...	=	2.5 ...	(3 at Wardhouse.)

From this it would seem as if the spruce increased steadily and rapidly up to ninety years, and then began to grow less, but still at a steady rate. The average for sixty years presents the greatest deviation, that is, if the age be correctly stated. Tonley is in the parish of Tough, and in the vale of Alford, probably one of the most fertile districts in the county. The results for 100 years are very close, considering the distance between the different localities.

In the statistical account of the parish of Monymusk, it is stated, that a spruce at Paradise is 11 feet 2 inches in circumference at the base, and five feet up separates into two equal stems, each rising 92 feet in height; it measures 212½ cubic feet.

On referring to Table III., the great girth of the tree at Invercauld must attract notice, especially when contrasted with trees about the same age, and its own girth at four feet up. The spruce often presents a very broad base of very irregular outline, so that its true circumference at that point cannot be ascertained by the usual means, but will be overrated; and this is no doubt true respecting the one alluded to.

The great size of some of the trees in the table, contrasted with their age, shews that this species finds a soil and climate congenial to it, in different parts of the county. Captain S. E. Cook observes, "although its timber, which is dry and light, may not equal that of some of the kindred species in utility for some purposes, it is a most valuable tree and well worthy more attention than it has received in an economic point of view."

Abies pectinata.—The Silver Fir. This species cannot be said to be of very general occurrence in Aberdeenshire; it is, however, found near the sea level, as at Philorth, and above 1000 feet at Invercauld and Mar Lodge.

Captain S. E. Cook says, "It is unquestionably less hardy than the spruce. It ranges less to the north, and farther to the south, than *Pinus sylvestris* or *Abies excelsa*. It descends into the comparatively genial climate of Navarre, and the Basque provinces."

TABLE IV.—*Abies pectinata.* THE SILVER FIR.

Girth at the Soil.		Girth at 4 Feet.		AGE.	SOIL.	LOCALITY.
Ft.	In.	Ft.	in.	Years.		
5	5	4	8	46	Heathy, sandy soil.	Philorth.
6	0	5	9	100	Clay bottom.	Pitfour.
8	0	5	9	...	... ...	......
11	6	10	11	100	Loamy surface, subsoil gravel.	Strichen.
6	2	6	0	100	Light mould and gravel.	Wardhouse,
4	4	.	.	.	. . .	Glassel.
12	0	9	0	70	Poor soil.	Breda.
12	0	9	6	100	Rich loamy clay.	Huntly Lodge.
6	10	5	0	70	Light sandy loam, subsoil gravel.	Ballater.
7	9	6	6	75?	Rich gravel.	Invercauld.
9	6	7	2	. .	. . . .	Mar Lodge.

There are six fine trees of this species at Huntly Lodge. The dimensions of the largest are given in the table; the smallest has a girth of 8 feet at the soil, and 7 feet 5 inches at 4 feet from the soil; they are said to have been planted by the first Duchess Dowager of Gordon in memory of some of her ancestors, The situation of those at Invercauld is "a south exposure, and the soil is of a rich gravelly nature; their entire height is from 70 to 80 feet; they appear to be healthy; their leading shoot extends from seven to nine inches yearly."

The mean annual increase in diameter at different ages is,

46 years = 5.1 lines (3 trees at Philorth).
70 ... = 7.08 ... (2 at Breda).
... ... = 4.08 ... (3 at Ballater).
75 ... = 4.62 ... (3 at Invercauld).
100 ... = 3.2 ... (3 at Pitfour).
... ... = 4.6 ... (6 at Huntly).
... ... = 2.6 ... (3 at Wardhouse).

Captain Cook, in the paper already quoted, states, that "the natural habitats of this species are rather characterized by humidity. This observation is of material importance, as to the economic value of the tree, because it would point out the species as particularly suited to most parts of these islands, of which the climate seems peculiarly fitted to its cultivation on an extended scale."

Mr Grigor of Forres, in his prize essay on forest plants, states, that it attains a greater size in 70 years than any other fir, provided the ground is deep and well sheltered. Captain Cook says, that the silver-fir would no doubt repay the cultivation in certain localities suited to it, its growth being rapid; and it resists the wind much better than the spruce. He alludes to an instance in which, near Plymouth, the proprietor of an estate there was offered, by the people of the dockyard, one hundred guineas for a single tree of this species; it was during the war and the highest prices. The same author alludes to a statement by Mr Salvin of Croxdale, near Durham, respecting it; who says, that the silver-fir, when felled and left on the ground, resists the effects of a humid climate and damp soil better than the larch, although the timber of the former is considered less valuable than that of the latter.

Pinus Strobus.—The Weymouth Pine. Two examples of this species were reported as growing at Aboyne, having the following dimensions:—

At base, 9 ft. 0 in.; at 4 feet, 7 ft. 8 in.
... 6 ft. 0 in.; ... 5 ft. 9 in.

They are situated in a rich alluvial soil, well sheltered, and are in a healthy state, their age about 70 or 80 years.

Mr Aitcheson, gardener at Huntly Lodge, informs me that the following trees were planted three years ago on the Binhill at Huntly, and are all thriving:

Cedrus Libani.
... Deodara.
Abies Morinda.
... Canadensis.
... taxifolia.
... Fraseri.
Pinus Austriaca.
... Laricio.
... pungens.
... resinosa.
... rigida.

Pinus Cembra and *P. pumilio* are growing on the top of the Binhill, at an elevation of 1000 feet above the sea.

Taxaceæ.—*Taxus baccata.*—The Yew. This tree, although now admitted into all catalogues of British plants, is yet believed by some to have been originally introduced. There have been, and still are, however, individuals in Britain of great age, for example, that of Fountain's Abbey, Yorkshire, said to be 1200 years old; another at Crowhurst, Surrey, 1400 years; and one believed to be still older at Fortingall, Perthshire, whose circumference in 1769 was 52 feet.

It is by no means common in Aberdeenshire, and there are few of great age. It is stated to be frequent in churchyards in England and Wales. I do not remember to have seen it in such a locality in this part of the country, the ash and the elm usually occupying its place.

Table V.—*Taxus baccata.* The Yew.

Girth at the Soil.		Girth at 4 Feet.		Age.	Soil.	Locality.
Ft.	in.	Ft.	in.	Years.		
6	6	5	11	200	Strong soil,—good shelter.	Leith Hall.
5	2	5	2	...	Sandy loam.	...
3	2	1	9	...	Strong damp soil,—exposed.	...
8	3	9	9	.	Light black loam, with gravel subsoil of 4 to 6 feet, under the gravel a considerable depth of stiff clay.	Ellon.
9	5	12	6	.	. . . .	...
10	4	12	10	.	. . . .	...
8	1	9	2	.	. . . .	...
7	10	10	10	.	. . . .	...
9	10	12	9	.	....	...

The average annual increase of the three trees at Leith Hall is,

No. 1 = 1.4 line.
No. 2 = 1.1 ...
No. 3 = 0.72 ...

the mean being 1.073 line.

The late Professor De Candolle in his essay on the longevity of trees, says,—"If we admit an average of a line annually for very old yews, it is probably within the truth, and that in reckoning the number of their years as equal to that of their lines of diameter, they are younger than they actually are." According, then, to this, if we suppose the three yews in our table to be of the same age as the number of lines in their respective diameters, the first ought to be nearly 300 years old, the second upwards of 200, and the third about 144 years of age. M. De Candolle's rule is not, therefore, generally applicable, at least to trees growing in this climate. Mr Bowman, in a paper read at the meeting of the British Association in 1836, has also proved its incorrectness in reference to yews growing in some parts of England and Wales. The yews at Ellon are branched off a little above the soil, but the branches remain in nearly a close body until about 4 feet up, and then they spread away. At Crathes the yew-trees are stated to be very fine, some of them growing in clefts of rocks, and all of natural growth, never having been planted in such situations. One of them measures at the base 5 ft. 6 in., and at four feet up 4 ft. 6 in.

CUPULIFERÆ.—*Quercus robur.*—The Oak. If it is admitted that there are two distinct species of oak in Britain, it is to be feared that the following results are of comparatively little value, since all the reports received refer simply to the oak, no distinction being made. When we consider that botanists of high authority are still divided in opinion respecting the existence of two distinct British species, we need not be astonished that gardeners and foresters, not many of whom study the distinctions of species, at least in such cases as this, should not discriminate between the two. Dr Greville, in a valuable paper on this subject, in the Transactions of the Edinburgh Botanical Society, comes to the conclusion that "The received botanical characters (founded on the comparative lengths of the peduncle and petiole) by which *Quercus robur* and *Q. sessiliflora* and the *Q. intermedia* of some authors are at present distinguished, pass into each other insensibly and completely, and cannot, therefore, be depended on in collecting acorns for seed, and supplying the dockyard with timber. A remarkable difference in the timber has long been observed, that of *Q. sessiliflora* being termed red oak, that of *Q. robur* white oak, from the colour of the wood." He farther states, that "the relative merits of the two kinds do not seem to be quite satisfactorily established; but the greatest weight of testimony seems to be in favour of red oak, contrary to the expressed opinion of Sir J. E. Smith; and it may still be a question, whether the superiority of the one timber over the other depends upon the specific difference of the tree."

The oak in Aberdeenshire extends from the level of the sea, as on the Buchan coast (and on the Kincardineshire sea cliffs ten miles south from Aberdeen), in which situation it forms low stunted bushes, to an elevation of 1400 feet on the Pannanich cliffs, where it is associated with the mountain ash, birch, and aspen. On the hill of Craigendarroch there are *natural oaks,* and in other places near Ballater and Monaltrie. All the trees in these stations appear to correspond with the description usually given of *Quercus robur*.

Oaks appear to have been in former periods more abundant, and of larger dimensions, than any existing at the present day in this part of the country. Several years ago, very large but mutilated trunks of oak trees were disinterred from a considerable depth at Poyner Neuk, near Aberdeen; one of these is still preserved upon the Inch at the harbour. And during the operations for conducting the water of the Dee to the engine-house at the old bridge, numerous oak stems were met with at a depth of nearly 20 feet below the surface of the soil; many of these were in a good state of preservation, and articles of furniture were manufactured from them. It is stated in the Statistical Account of the Parish of Drumblade that several oaks of considerable size were found there imbedded in peat.

TABLE VI.—*Quercus robur*. THE OAK.

Girth at the Soil.		Girth at 4 Feet.		AGE.	SOIL.	LOCALITY.
Ft.	in.	Ft.	in.	Years.		
8	6	.		175	Clay loam, on clay.	Philorth (girth at 2 feet).
7	6	5	0	100	Clay bottom.	Pitfour.
4	6	4	0	20	Rocky bottom.	Aden.
2	4	1	10	45	Dark soil.	Kinmundy.
8	0	7	6	300	Loam surface,—clay subsoil.	Strichen.
7	3	4	10	.	. . . .	Cluny.
8	0	7	0	70?	. . . .	Crathes.
6	10	.		.	. . . .	Glassel.
8	8	6	0	.	Red gravel on clay.	Tonley.
6	5	5	7	200	Strong black loam.	Leith Hall.
3	0	2	8	65	Rocky bottom.	... ...
7	6	6	6	70	Poor soil.	Breda.
4	3	3	6	200	Alluvial soil on clay.	Haughton.
10	0	9	6	90	Rich loam.	Huntly Lodge.
1	10	1	8	28	. . .	Newe.
10	0	8	10	80	Rich deep alluvial soil.	Aboyne.
7	0	5	7	.	Sandy loam,—gravel bottom.	Ballater (Natural Oak).

On reviewing this table, several striking contrasts will be observed, for instance, between those at Aden and Kinmundy, and Breda and Haughton. Mere differences of soil can scarcely account for these discrepancies, probably the reports may allude to (the so called) different species, or the ages have not been correctly ascertained.

The average annual increase at different ages, is as follows:—

70 years, . .	= 4.4 lines.	(3 at Breda.)
90	= 4.8 ...	(3 at Huntly.)
100	= 2.8 ...	(3 at Pitfour.)
200	= 1.4 ...	(2 at Leith Hall.)
300	= 1.1 ...	(3 at Strichen.)

As it is probable that the reports may have related to different species, it would be rash, at present, to draw any conclusions from these results. De Candolle says,—"The oak is undoubtedly one of the most long lived trees of Europe; but its study is involved in great ambiguity, either because it is a tree which, by the admission of foresters, is principally modified by soil, or because the wood of *Quercus pedunculata*, which grows quickly and to a great height, has been very generally confounded with the *Quercus sessiliflora*, which grows more slowly, becomes *harder and is more tortuous*."

Two examples of the hornbeam (*Carpinus betulus*) were reported, one at Crathes having a girth of 9 feet 6 inches at the ground, age 70 to 90 years, and another at Aboyne, measuring 9 feet in girth, the age about 95 years.

Fagus sylvatica.—The Beech. This tree is rather general in Aberdeenshire. I have not, however, been able hitherto to ascertain its upper limits.

According to Mirbel, it occurs in Palestine, Asia Minor, Armenia, Mazanderan, Greece, Sicily, S. Italy, Valencia; it is naturalized in Britain, Norway, to 59° in favourable situations, Sweden to 58° 30′, in Westrogoth to 57°, in Smoland to Calmar on the shores of the Baltic, in great forests in Scania and Smoland, Russia, Lithuania and Poland, South Crimea, Caucasus to Terek, but no other part of Russia.

According to Von Buch, between 45¼° and 46½° N. Lat., the line of beeches on the Alps rises to 5132 feet, the snow line being 3848 feet higher.

TABLE VII.—*Fagus sylvatica.* THE BEECH.

Girth at the Soil.		Girth at 4 Feet.		AGE.	SOIL.	LOCALITY.
Ft.	in.	Ft.	in.	Years.		
10	9	8	11	.	Light soil, 2 feet deep.	Parkhill.
11	4	9	2	175	Clay loam on clay.	Philorth.
10	0	8	0	100	Clay bottom.	Pitfour.
4	3	3	0	45	Peat soil.	Kinmundy.
11	6	11	0	200	Loamy surface,—clay subsoil.	Strichen.
12	0	10	6	60	Subsoil, hard clay.	Echt.
12	4	10	2	.	. . . . .	Cluny.
.		12	5	100	Sandy soil.	Kemnay.
12	0	11	0	100	. . . . .	Wardhouse.
11	0	8	4	.	Red gravel on clay.	Tonley.
25	6	18	6	above 100	. . . . .	Crathes.
6	10	.		.	. . . . .	Glassel.
10	4	.		95	Light sandy loam on rock.	Ellon.
8	6	.		95	... ...	...
10	0	8	2	100	Fine yellow soil on rock.	Leith Hall.
7	3	5	8	90	... ...	...
7	2	5	11	70	Poor soil.	Haughton.
11	3	9	0	.	. . .	Whitehaugh.
12	0	8	10	.	. . .	Balfluig (Alford).
12	6	10	9	100	Rich loamy clay.	Huntly Lodge.
20	0	17	0	200	Rich sandy loam.	... ...
6	4	6	0	90	Black surface, yellow bottom.	Edinglassie.
10	0	9	2	85	Deep rich alluvial.	Aboyne.
6	6	4	6	.	. . .	Abergeldie.

From the accompanying table it will be evident that this county presents, in many parts, a soil and climate favourable to the growth of this tree.

The beech at Crathes, at 12 feet up, divides into seven or eight very strong branches, and it overshadows nearly half an acre of ground. Respecting the one at Huntly Lodge, generally known by the name of the Castle Park Beech, the gardener writes,—" This once stupendous and beautiful tree is now fast verging to decay, its branches are withered, and no more of its stately structure remains to perpetuate its memory than part of its stem about 20 feet high. Its branches appear to have occupied a space of about 120 yards in circumference."

In the Statistical Account of the Parish of Meldrum, reference is made to some fine beeches near the House of Meldrum, and one, in particular, is about 60 feet high; its branches occupy a space of 243 feet in circumference, the girth of the trunk is 11 feet 8 inches, and the longest entire branch is 51 feet.

The following presents the annual average increase in diameter at different ages:—

45 years	=	3.9 lines	(3 at Kinmundy.)
60 ...	=	7.5 ...	(4 at Echt.)
70 ...	=	4.4 ...	(3 at Haughton.)
90 ...	=	3.9 ...	(3 at Edinglassie.)
100 ...	=	4.5 ...	(3 at Pitfour.)
... ...	=	4.4 ...	(3 at Wardhouse.)
... ...	=	4.3 ...	(3 at Leith Hall.)
... ...	=	5.3 ...	(3 at Huntly.)
176 ...	=	2.5 ...	(3 at Philorth.)

The beech seems of very rapid growth under favourable circumstances. It is reported to be the most thriving tree near Cluny Castle. Beech trees are very numerous and thriving about Tonley. The natural soil at Wardhouse is a thin stratum of light mould, with a good mixture of gravel, and a hard gravelly bottom; numerous trees of different kinds thrive in it, but it is considered best for beech. The gardener at Leith Hall has observed the best trees of this kind to grow in good soil, with gravel or rock under it; it will also do well on thin light soil; where it is desirable to have it of large size, it ought to be well sheltered from the wind.

Corylus avellana.—The Hazel. This plant occurs naturally in different parts of the country; it is common about Aberdeen, near the level of the sea, and in the interior reaches an elevation of 1600 feet. Its remains are of frequent occurrence under deposits of peat, the nuts being often found in an entire state, along with the roots and branches of the parent trees on which they grew. At Corymulzie Linn, near Castleton of Braemar, and at an elevation of about 1100 feet, I measured a trunk of it cut at the ground, and found it two feet two inches in circumference; it presented sixty zones, which were of very uniform size, the first six and the last ten were, however, rather narrower than the others.

Castanea vulgaris.—The Chestnut. This tree is not very frequent in Aberdeenshire. According to Mirbel, it does not ripen its fruit excepting where the vine is successfully cultivated. Mr Winch states, that it does not ripen fruit in the northern counties of England between 54° and 55° lat.

TABLE VIII.—*Castanea vulgaris.* THE CHESTNUT.

Girth at the soil.	Girth at 4 feet.	AGE.	SOIL.	LOCALITY.
Ft. in.	Ft. in.	Years.		
15 2	11 10	.	Gravel on clay and rock.	Waterton (near Ellon).
7 6	6 6	70?	. . . . .	Crathes.
4 6	. .	.	. . . . .	Glassel.
14 0	11 4	.	. . . . .	Tonley.
13 3	10 0	95	Deep rich alluvial soil.	Aboyne.
4 4	3 5	.	Sandy soil.	Ballater.

From the few examples here recorded, it would appear that this tree thrives well in different parts of the county; and it is to be regretted that the ages have not been satisfactorily ascertained in any of the cases. I am not aware whether its fruit ever arrives at maturity in this part of the country.

TILIACEÆ.—*Tilia europæa.*—The Lime Tree. It appears doubtful whether the measurements recorded in the following table all refer to the same species; it is, however, very probable that they do.

I have not had an opportunity of measuring the absolute highest elevation attained by the lime tree in this country; it is stated, however, that it thrives well at Ballater at an altitude of 800 feet, and at Birkhall, which is somewhat higher.

TABLE IX.—*Tilia europæa.* THE LIME TREE.

Girth at the Soil.	Girth at 4 Feet.	AGE.	SOIL.	LOCALITY.
Ft. in.	Ft. in.	Years.		
9 4	6 2	.	Sandy loam, gravel subsoil.	Ellon.
10 4	5 3	176	Clay loam, on clay.	Philorth (Girth at 2 and 4 feet).
5 0	4 9	50	Rocky bottom.	Aden.
7 1	6 5	70 to 90?	Gravel subsoil.	Strichen.
6 4	4 10	. .	. . . . .	Cluny.
11 6	7 6	70 to 90?	. . . . .	Crathes.
4 8	. .	. .	. . . . .	Glassel.
7 0	5 6	. .	Red gravel, on clay.	Tonley.
7 1	5 6	180	Strong loam.	Leith Hall.
6 2	5 0	160	... ...	... ...
6 6	4 6	70	Poor soil.	Breda.
11 6	9 8	95	Deep rich alluvial soil.	Aboyne.
6 0	5 3		. . . . .	Birkhall.

The average annual increase at different ages is as follows:—

50 years = 3.8 lines (3 at Aden.)
70 ... = 4.0 ... (2 at Breda.)
160 ... = 1.7 ... (2 at Leith Hall.)
176 ... = 2.6 ... (1 at Philorth.)
180 ... = 1.7 ... (2 at Leith Hall.)

De Candolle stated, that, under favourable circumstances, the average annual increase *of the lime ought to be four lines.*

FRAXINEÆ.—*Fraxinus excelsior.*—The Ash. This tree is of common occurrence in Aberdeenshire, and, provided it has a favourable soil, appears to thrive even at a considerable elevation. At Invercauld there are examples of it which can scarcely be exceeded by those in any other part of the county, and at an elevation exceeding 1300 feet; at Lloin Muich, near Ballater, there are several in a thriving condition.

This tree is generally among the latest to open its buds, and hence its young leaves are less liable to suffer from unfavourable weather in the season of spring, and this would seem to render it suitable for cultivation at elevations even higher than those alluded to.

TABLE X.—*Fraxinus excelsior.* THE ASH.

Girth at the soil.	Girth at 4 feet.	AGE.	SOIL.	LOCALITY.
Ft. in.	Ft. in.	Years.		
10 0	6 0	Above 60	Light mould, on ferruginous gravel.	Craibston.
12 0	7 3	120	... ...	...
10 4	9 10	.	Black loam on gravel and clay.	Ellon.
6 2	.	110	Sandy loam, on gravel.	...
11 7	9 6	.	Light soil.	Parkhill.
9 3	7 8	176	Clay loam, on clay.	Philorth.
7 0	6 4	60	Rocky bottom.	Aden.
5 6	3 2	45	Peat soil.	Kinmundy.
12 6	12 0	300	Clay subsoil.	Strichen.
7 8	6 6	60	Garden soil.	Echt.
13 2	7 8	.	. . . .	Cluny.
9 8	. .	.	. . . .	Glassel.
13 0	9 6	70 to 90	. . . .	Crathes.
15 9	9 5	. .	. . . .	Tonley.
11 10	9 3	200	Fine dry soil.	Leith Hall.
9 10	6 7	200	Black loam, rather wet.	...
	8 10	200	Black loam, on gravel.	Kemnay.
11 9	11 5	200 to 300	Alluvial soil, on clay and gravel.	Haughton.
5 0	4 8	70	. . . .	Breda.
10 2	7 6	100	Rich clay loam.	Huntly.
12 7	9 0	.	. . . .	Glenkindy.
9 7	9 0	100	Strong heavy soil.	Newe.
9 3	8 6	150?	Sandy soil.	Brakely.
5 0	3 9	80?	Debris of serpentine.	Lloin Muich. (1347 ft.).
8 0	6 8	.	. . . .	Birkhall.
12 4	8 10	.	. . . .	Abergeldie.
13 4	10 7	150	Black loam, on gravel.	Invercauld.
18 0	15 0	Above 200	Rich soil, on hard clay.	Aboyne.
10 1	9 10	Age?	... ...	...
9 10	8 7	...	... ...	...

The mean annual increase at different ages is as follows:—

45 years = 4.5 lines (3 at Kinmundy.)
100 ... = 4.04 ... (3 at Huntly.)
100 ... = 4.05 ... (3 at Newe.)
150 ... = 4.02 ... (2 at Invercauld.)
200 ... = 2.4 ... (2 at Leith Hall.)
300 ... = 1.7 ... (3 at Strichen.)

The ash is generally of very rapid growth; this, however, does not render its timber less valuable, but rather the reverse; for Mr Campbell, an experienced timber-merchant here, informs me that the value is nearly directly as the rapidity of growth.

A section of an ash at Colquhonnie, in Strathdon, shewed 111 annual zones. Its girth at the soil was 9 feet 5 inches; the pith was rather eccentric. The following will shew the increase at different periods:—

Zones 1 to 10 = 1 inches.
... 10 to 20 = 2
... 20 to 30 = 2
... 30 to 40 = 1.5
... 40 to 50 = 1.25
... 50 to 60 = 1
... 60 to 70 = 1.25
... 70 to 80 = 1.12
... 80 to 90 = 1
... 90 to 100 = 0.8
... 100 to 111 = 1.8

A fine example of the ash in the vicinity of Aberdeen, which was planted on the day on which the battle of Culloden was fought, now measures nine feet four inches at six feet from the soil.

ULMACEÆ.—*Ulmus montana.*—The Scotch Elm. In none of the reports was any distinction made between the Scotch and English elm; the former, however, being common, and reaching considerable dimensions in this part of the country, it is probable that all the measurements had reference to it. This tree is often seen associated with the ash, sycamore, gean, and mountain-ash, near ruins and former seats of small proprietors, so numerous at one time. It is very general throughout the county; and if we may judge from the luxuriance of it at Invercauld, in the heart of the Aberdeenshire Highlands, and exceeding 1000 feet above the sea, it would appear to be well fitted for cultivation in most districts.

TABLE XI.—*Ulmus montana.* THE SCOTCH ELM.

Girth at the Soil.		Girth at 4 Feet.		AGE.	SOIL.	LOCALITY.
Ft.	in.	Ft.	in.	Years.		
10	1	9	8	120	Vegetable mould, on ferruginous gravel.	Craibston.
12	0	8	0	120	... ...	...
9	10	8	4	176	Clay loam, on clay.	Philorth.
11	6	9	6	100	Vegetable soil 7 feet deep.	Abbey of Deer.
8	0	7	8	.	. . . .	Echt.
10	0	9	4	.	. . . .	Cluny.
4	5	.	.	.	. . . .	Glassel.
8	6	6	6	.	. . . .	Tonley.
9	10	7	9	180	Strong brown loam.	Leith Hall.
4	8	3	8	39	Strong clay—much exposed.	... ...
9	1	7	2	70	. . . .	Breda.
8	4	6	4	90	Rich clay loam.	Huntly Lodge.
7	0	5	9	.	. . . .	Glenkindy.
7	6	7	4	100	Strong heavy soil.	Newe.
8	2	7	5	90	. . . .	Edinglassie.
11	7	8	9	95	Deep rich alluvial.	Aboyne.
7	0	6	0	.	. . . .	Birkhall.
11	10	7	5	150	Dry black loam, on gravel.	Invercauld.

The following exhibits the average increase at different ages:—

50 years, = 4.8 lines, (3 at Aden).
70 ...... = 5.3 ...... (2 at Breda).
90 ...... = 3.8 ...... (3 at Edinglassie).
100 ...... = 3.02 ... (3 at Newe).
150 ...... = 3.5 ...... (2 at Invercauld).
180 ...... = 2.3 ...... (3 at Leith Hall).

From these results it would seem that the elm increases considerably even at a great age.

The timber produced by elms of Aberdeenshire growth is stated to be of excellent quality, and worth 2s. to 2s. 6d. a foot.

ACERACEÆ.—*Acer Pseudo-platanus.*—The Sycamore. This tree is commonly called the Plane, in this part of the country. It is of very general occurrence in Aberdeenshire; large individuals occur in this vicinity, and I have seen some of considerable size near Castleton of Braemar, at an elevation exceeding 1000 feet.

TABLE XII.—*Acer Pseudo-platanus.* THE SYCAMORE.

Girth at the Soil.	Girth at 4 Feet.	AGE.	SOIL.	LOCALITY.
Ft. in.	Ft. in.	Years.		
11 4	6 8	120	Vegetable mould, on ferruginous gravel.	Craibston.
7 9	6 2	.	Sandy loam, on gravel.	Ellon.
8 11	7 3	.	. . . .	Aberdeen.
8 2	7 6	176	Clay loam, on clay.	Philorth.
7 0	5 0	100	Clay bottom.	Pitfour.
4 6	3 9	50	Rocky bottom.	Aden.
2 8	1 11	30	Peat soil.	Kinmundy.
9 6	6 4	.	. . . .	... ...
8 2	7 9	90	Subsoil gravel.	Strichen.
8 10	. .	.	. . . .	Glassel.
. .	10 0	.	. . . .	Finzean.
12 0	9 0	70 to 90	. . . .	Crathes.
8 6	7 0	.	. . . .	Cluny.
14 5	9 9	.	. . . .	Tonley.
12 8	9 9	300	Fine deep soil, on gravel.	Leith Hall.
11 6	9 3	200	Good loam, exposed.	... ...
. .	6 6	.	. . . .	Kemnay.
9 2	8 6	80	. . . .	Breda.
11 7	11 1	.	. . . .	Glenkindy.
8 4	8 2	100	Good soil.	Newe.
7 8	6 7	100	Strong heavy soil.	Edinglassie.
10 2	8 8	120?	Sharp light soil, on gravel.	Aboyne.
7 7	6 0	.	. . . .	Abergeldie.
4 4	4 0	.	. . . .	Corrymulzie.

The average increase is as follows :—

50 years = 3.8 lines, (3 at Aden).
100 ...... = 2.5 ...... (3 at Pitfour).
... . = 3.5 ...... (3 at Newe).
... . = 3.2 ...... (3 at Edinglassie).
200 ...... = 2.2 ...... (2 at Leith Hall).
300 ...... = 1.8 ...... (2 at Leith Hall).

It is stated that this species yields a saccharine juice in spring like the *Acer saccharinum* of America.

Its wood is about the same value as that of beech, but is not in great demand.

BETULACEÆ.—*Betula alba.*—The Birch. This beautiful tree is abundant in many parts of this county, becoming, however, more common in the interior, where it exists in a state of nature, and often attains a great size. I have seen it at an elevation of 2000 feet, but do not consider this as its absolute limits. Mr H. C. Watson, in his work on the geographical distribution of British plants, states, that he has seen it on

Ben Nevis at 3500 feet, and on the authority of Mr Winch, says, that, in the north of England, it is not found on the mountains higher than *Acer Pseudo-platanus.* It attains large dimensions at Invercauld and other places, where it is *natural;* frequently, however, it appears in the interior, on open moors, in the form of low stunted bushes, where, along with the juniper, it occupies the place of the whin and broom, which have disappeared.

Sir G. Mackenzie states, that, in an Icelandic forest, the most stately birch rises to the height of only 10 feet. Von Buch considers the birch to require a mean temperature above 26° F. He states, that, in Lapland, the line of birches is 1937 feet below the snow line, and 802 above that of Scotch firs. Wahlenberg gives 1950 feet for its limit under 68° N. Lat., the snow line being 3640.

TABLE XIII.—*Betula alba.* THE BIRCH.

Girth at the Soil.		Girth at 4 Feet.		AGE.	SOIL.	LOCALITY.
Ft.	in.	Ft.	in.	Years.		
7	0	5	0	50 to 60	Vegetable mould, on ferruginous gravel.	Craibston.
6	0	5	0	100	Clay bottom.	Pitfour.
1	3	1	0	20	Peat soil.	Kinmundy.
5	10	5	2	70 to 90	Black mould, on clay.	Strichen.
7	4	6	0	. .	. . .	Cluny.
.		6	6	. .	. . .	Finzean.
7	6	.		. .	. . .	Glassel.
7	0	6	0	. .	Gravel on clay.	Tonley.
5	3	4	9	. .	Alluvial, on clay and gravel.	Haughton.
7	5	5	7	70	. . .	Breda.
6	6	5	2	.	. . .	Glenkindy.
5	2	4	4	100	Sharp dry soil.	Newe.
7	0	6	0	90	... ...	Edinglassie.
9	0	8	1	.	Deep rich soil.	Aboyne.
6	0	5	6	.	Dry sandy loam on gravel.	Ballater.
6	0	5	0	.	. . .	Birkhall.
5	7	4	10	.	. . .	Abergeldie.
3	6	3	2	.	. . .	Loch Muich.
13	0	6 5	6 8	200?	. . .	Invercauld.
9	0	6	2	.	. . .	......
7	6	6	2	.	. . .	Clabochie (Braemar).
8	8	8	2	.	. . .	Craggan (Braemar).

The annual average increase at different ages is,—

20 years = 2.6 lines, (3 at Kinmundy).
70 ...... = 4.8 ...... (2 at Breda).
90 ...... = 3.1 ...... (3 at Edinglassie).
100 ...... = 2.3 ...... (3 at Pitfour).
... . = 2.08 ... (3 at Newe.)

On reviewing the table it would seem that the size attained by the birch becomes greater on passing inland. There can be little doubt that it is exceedingly liable to be affected by differences of soil and climate. It would be interesting to know the exact age of the large example at Invercauld; on the supposition that it is 200 years, this would give an annual mean of 2.9 lines.

Although scarcely worthy of being ranked as a tree, it may be deserving of notice that the *Betula nana*, Dwarf Birch, is exceedingly abundant in the higher districts, its lowest limit being 1600 feet, and reaching nearly 3000; I possess a stem of this plant four-tenths of an inch in diameter, and having 14 annual rings.

Alnus glutinosa.—The Alder. This tree attains about 1500 feet of elevation in Aberdeenshire, and occurs also near the sea-level. The finest examples I have seen, are at Castleton of Braemar, on the banks of the Water of Cluny, at an elevation above 1000 feet.

TABLE XIV.—*Alnus glutinosa.* THE ALDER.

Girth at the soil.		Girth at 4 feet.		AGE.	SOIL.	LOCALITY.
Ft.	in.	Ft.	in.	Years.		
6	5	6	2	70 to 90	Deep black soil, on clay.	Strichen.
5	6	4	2	.	. . . .	Tonley.
8	2	7	5	.	Alluvial, on clay and gravel.	Haughton.
6	3	4	10	70	Poor soil.	Breda.
5	4	4	9	90	Marshy clay.	Huntly Lodge.
8	6	5	9	60 to 70	Sandy.	Invercauld.
8	1	5	0	...	...	...
7	9	5	0	...	...	...

The mean annual growth is—

70 years, = 4 lines. (2 at Breda.)
90 ... = 2.4 ... (3 at Huntly.)

"At Echt, the alder seems to have covered all the low grounds at a former period. At present, it thrives well for 20 years, and comes to sizes fit for useful purposes."

The wood, from its colour, is usually called Scotch mahogany, and is stated to afford superior material for piles.

POMACEÆ.—*Pyrus aucuparia.*—The Rowan. This tree is very common in Aberdeenshire, from the sea-level, where (and generally over the lower districts), it has been planted, to an elevation of at least 2000 feet. I have seen it on the Pannanich cliffs at 1600 feet, associated with *Quercus robur*, *Betula alba*, and *Populus tremula*, all the four being natural trees. In Forfarshire, Mr Watson has seen it at an elevation of 2500 feet.

TABLE XV.—*Pyrus aucuparia*. THE ROWAN.

Girth at the soil.		Girth at 4 feet.		AGE.	SOIL.	LOCALITY.
Ft.	in.	Ft.	in.	Years.		
4	3	3	11	70 to 90	Black mould, on clay.	Strichen.
6	6	4	7	65	Good deep soil.	Leith Hall.
4	0	3	8	39	Gravel subsoil.	...
5	0	4	8	20?	Poor soil.	Breda.
5	0	4	4	100	Sharp dry soil.	Newe.
7	1	6	3	90	...	Edinglassie.
6	6	4	9	.	. . .	Dee Castle.
4	8	4	1	.	. . .	Glen Muich.
6	5	4	10	.	. . .	Abergeldie.
7	8	5	0	.	. . .	Glen Gairden.
7	0	5	7	70 to 80	Hard gravel, on rock.	Invercauld.

Mean annual rate of increase—

65 years, = 3.8 lines. (2 at Leith Hall.)
90 ... = 3.4 ... (3 at Edinglassie.)
100 ... = 2.04 ... (3 at Newe.)

This tree bears fruit copiously in all parts of the county.

Cratægus oxyacantha.—The Hawthorn. I have not been able to ascertain the upper limit of this in Aberdeenshire. Mr Watson states that it rises somewhat higher than the common whin, viz. to 1300 feet.

TABLE XVI.—*Cratægus oxyacantha*. THE HAWTHORN.

Girth at the soil.		Girth at 4 feet.		AGE.	SOIL.	LOCALITY.
Ft.	in.	Ft.	in.	Years.		
5	0	3	9	100	Vegetable mould.	Aberdeen.
4	9	3	7	.	. . .	Cluny.
4	8	4	0	.	. . .	Tonley.
4	6	3	4	180	Dry brown mould.	Leith Hall.
4	4	4	2	...	...	...

One near Aberdeen, 1 foot 8 in. girth, at the soil had 28 annual rings, which were of very uniform thickness.

The hawthorn being usually planted to form hedges, seldom, under such circumstances, reaches any great size. Planted singly, however, and in good soil, it often attains considerable dimensions, and lives to a great age.

AMYGDALEÆ.—*Prunus Cerasus.*—The Cherry and Gean. In the reports received respecting this species, no reference was made to the different varieties of it; this is, however, probably of little importance. It is of general occurrence in Aberdeenshire in gardens, or where these formerly existed. There are few places (perhaps none) where it can be considered truly wild. It attains considerable dimensions, even in places where few trees of any kind now exist, as at Dalphad in Glen Gairden. According to Mirbel, its cultivation ceases in Russia beyond 55° and 56° N. lat. Malte Brun states, that cherries sometimes ripen on the coasts of E. Bothnia, 63° to 64°. In Norway, it produces fruit to 63° N.

TABLE XVII.—*Prunus Cerasus.* THE GEAN.

Girth at the soil.		Girth at 4 feet.		AGE.	SOIL.	LOCALITY.
Ft.	in.	Ft.	in.	Years.		
7	0	6	3	100	Deep vegetable soil.	Abbey of Deer.
5	6	5	0	70	Loam, on gravel.	Strichen.
6	0	5	3	.	. . .	Echt.
7	8	6	0	70?	Vegetable mould, on ferruginous gravel.	Craibston (near Aberdeen).
9	6	6	8	.	. . .	Cluny.
9	8	6	11	.	. . .	Tonley.
2	5	2	0	25	. . .	... (cherry).
7	0	5	2	180	Sandy loam.	Leith Hall.
4	4	4	0	30	. . .	Breda.
9	9	7	4	100	Rich clay loam.	Huntly Lodge.
4	3	4	1	100	. . .	Newe.
8	0	7	6	90	. . .	Edinglassie.
5	5	.		40	Light sandy soil.	Ballater.
7	0	5	2	.	. . .	Dee Castle.
7	7	.		.	. . .	Dalphad (Glen Gairden, 1500 feet ?).
6	10	6	2	.	. . .	Birkhall.

Mean rate of increase—

25 years, = 4.4 lines. (1 at Tonley.)
70 ... = 3.5 ... (1 at Strichen.)
90 ... = 3.8 ... (3 at Edinglassie.)
100 ... = 4.2 ... (3 at Huntly.)

An example of this tree in the vicinity of Aberdeen, 4 feet 5 in. in girth, at the soil had 35 annual rings; the proportion at different periods was—

Zones 1 to 10, = 2.5. inches.
... 10 to 20, = 2.5.
... 20 to 30, = 2.75.
... 30 to 35, = 1.

Prunus spinosa, the Black Thorn or Sloe, occasionally attains a considerable size; for instance, one at Crathes measures in girth at the soil 6½ feet, and at 4 feet up, 4½ feet. It most usually, however, assumes a stunted, bushy form.

SALICACEÆ.—*Populus tremula*.—The Aspen. This tree is of frequent occurrence in Aberdeenshire, especially in the interior, where it is in a state of nature. It has been seen by Mr Watson at an elevation of 1600 feet in Braemar, but I believe it is found even higher than this. It occurs in the whole of the South of Europe, Asia Minor, Armenia, Caucasus, and Lapland, to the Frozen Ocean. It is abundant in Russia, from the Baltic to Lena, beyond which it is rare, reaching, however, to 62° N.

TABLE XVIII.—*Populus tremula*. THE ASPEN.

Girth at the soil.		Girth at 4 feet.		AGE.	SOIL.	LOCALITY.
Ft.	in.	Ft.	in.	Years.		
5	9	5	0	.	. .	Glenkindy.
4	4	3	4	.	Sandy loam.	Ballater.
3	4	3	0	27	. .	Edinglassie.
10	6	6	10	150 to 200	Hard gravel.	Invercauld.
				OTHER SPECIES OF POPLAR.		
3	9	3	0	50?	Rocky bottom.	Aden (Lombardy).
5	3	4	11	70 to 90	Gravel subsoil.	Strichen (Black poplar).
4	1	3	9	...	...	... (Lombardy).
11	2	8	6	.	. .	Tonley (Hoary poplar).
7	3	7	1	67	Black wet soil.	Leith Hall (Black poplar).
6	0	4	8	45	Clay and gravel.	... (Lombardy).

Salix alba.—The White Willow, &c. Few of the reports alluded to the particular species of which measurements were taken. The Huntingdon or White seems, however, the most common in this part of the country which reaches any great size.

TABLE XIX.—*Salix alba.* THE HUNTINGDON WILLOW.

Girth at the soil.	Girth at 4 feet.	Age.	Soil.	Locality.
Ft. in.	Ft. in.	Years.		
6 4	5 5	176 ?	Clay loam, on clay.	Philorth.
6 2	5 7	50	Rocky bottom.	Aden.
9 0	8 4	.	Sour clay subsoil.	Echt (Salix alba, Huntingdon.)
6 0	5 1	39	Damp clay.	Leith Hall.
7 3	5 10 4 3 Twins.	.	. .	Glenkindy (Huntingdon willow.)
5 0	4 8	27	. .	Edinglassie.
5 3	5 0	.	. .	Birkhall.

This species is of very rapid growth. An example of it—in a garden in this vicinity—was planted 21 years ago, and now measures in girth at the soil 3 feet 9 in.; another, in the same place, 17 years old, has a girth at the soil of 3 feet 7½ in. The first of these is growing in hard gravel; the last, in rich garden soil resting on gravel.

JUGLANDEÆ.—*Juglans regia.*—The Walnut. This tree is not very frequent in this part of the country. Under favourable circumstances, however, it is capable of attaining considerable size.

TABLE XX.—*Juglans regia.* THE WALNUT.

Girth at the soil.	Girth at 4 feet.	Age.	Soil.	Locality.
Ft. in.	Ft. in	Years.		
6 0	4 2	60 to 70	Vegetable mould, on ferruginous gravel.	Craibston.
	3 7	.	Peat and sand.	Kemnay.
	4 1	.	...	...
7 0	5 6	70 to 90	. . . .	Crathes.
3 4	.	.	. . . .	Glassel.

At Huntly Lodge, there is one about 100 years old, growing in rich clay. Its girth at the soil is 6 feet 6 in.

HIPPOCASTANEÆ. — *Æsculus Hippocastanum.* — The Horse Chestnut. This tree appears to find a soil and climate suited to it in several parts of Aberdeenshire, and that even at a considerable elevation, as at Invercauld.

TABLE XXI.—*Æsculus Hippocastanum.* THE HORSE-CHESTNUT.

Girth at the soil.	Girth at 4 feet.	AGE.	SOIL.	LOCALITY.
Ft. in.	Ft. in.	Years.		
9 6	7 1	90 to 100	Vegetable mould, on ferruginous gravel.	Craibston.
8 6	7 0	.	Rich garden mould.	Pitfour.
9 5	6 8	.	. . . .	Balfling.
12 6	9 0	70 to 90	. . . .	Crathes.
12 7	7 9	140 to 150	Black loam, on hard gravel.	Invercauld.

AQUIFOLIACEÆ.—*Ilex Aquifolium.*—The Holly. There are few situations in this county favourable to the growth of this plant. It seldom attains any great size, especially near the sea; more inland, however, it appears to thrive better. Mr Watson alludes to its occurrence at 900 feet of elevation, at Loch Eil, Argyleshire. It occurs in Western and Eastern Asia, and, according to Wahlenberg, is a doubtful native of Sweden.

Dr R. Brown, when on a visit to Aberdeen in September last, stated, that in Germany it is treated as a greenhouse plant.

TABLE XXII.—*Ilex Aquifolium.* THE HOLLY.

Girth at the soil.	Girth at 4 feet.	AGE.	SOIL.	LOCALITY.
Ft. in.	Ft. in.	Years.		
4 0	3 10	120 ?	Light black loam, on gravel.	Ellon.
5 0	.	.	. . . .	Midmar.
4 6	3 6	70 to 90	. . . .	Crathes.
6 4	5 9	.	. . . .	Blackhall.

The finest examples of it are to be seen in the neighbourhood of Upper Banchory. There is, on the south side of the garden of Finzean, a hedge composed of this plant. Its length on each side of the avenue to the house is 70 yards, the height being 10 feet, the breadth 8 feet. In the woods of Glassel, thousands of young plants spring up naturally.

VETERINARY MEDICINE.*

It has sometimes occurred to us to enquire, whether, even in these the palmy days of agriculture, the, in some respects, subsidiary science of Veterinary Medicine has received that degree of attention, to which, in a statistical point of view, it appears to us to be peculiarly entitled. When we consider the amount of capital which is embarked in the breeding, rearing, and maintaining of the various domesticated animals; and when we estimate their immense value to us for the purposes of pleasure, military defence, labour, and food; we must, if we have not previously given our attention to the subject, be startled by the mass of vast and complicated interests which is laid open before us, and be led to acknowledge how extensive must be the influence of these upon the wealth and resources of the empire. And here it is not enough for us simply to admit with the statistician, that the value of the stock of horses, cattle, and sheep, existing, at an average, in Great Britain alone, exclusive of Ireland, and exclusive of our colonies, amounts, in round numbers, to upwards of 120 millions sterling. We must proceed farther than this. We should learn at what expense this prodigious amount has been raised:—and examining the question more closely, in a veterinary point of view, we must attempt to ascertain what proportion of the general stock has fallen through sickness, and has become unprofitable in its progress towards maturity; and, with especial reference to that portion employed in labour, what has been the amount of loss of time, and of time's worth, through the merely disabling effects of disease, even where its results have not been fatal.

These are undoubtedly intricate questions, and the materials which we possess for their solution are, at present, very inadequate. Still we have attempted to make some approach to what may be the real truth; and shall state, without detaining the reader by any details, to dwell upon which would be inconsistent with our present purpose, that any improvement in the prevention and cure of the diseases of animals which should diminish by only one-tenth the sum of the attacks of sickness, and the number of natural deaths, in those destined for slaughter,—and which should subtract only one-tenth from the days of occasional disability, and add one-tenth to the average duration of the whole working period of life, in those intended for labour, would increase the resources of the nation by an amount of fully two millions sterling annually. In making this estimate, let it be observed, that we have taken no note of the value of dogs, asses, deer, goats, hogs, &c., and that we have not included in it the whole extent of the empire. Still less have we set any account upon those feelings which lead us frequently to look upon our animal favourites with something more than a regard to their marketable worth, and which direct us so to extend our care over all creatures made dependent upon us, as to protect them from every suffering beyond those necessarily incident to their condition. Speaking with views simply financial, the amount which we have named is not a contemptible one; and we may have occasion, in the context, to present some proof, that there is ample room for that improvement in the science of veterinary medicine which is necessary for its attainment.

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* Hippo-pathology: A Systematic Treatise on the Disorders and Lamenesses of the Horse. By William Percivall, M.R.C.S., &c. Vol. ii. London, 1841.

A Manual of Veterinary Science. By William Dick, Professor of Veterinary Surgery to the Highland and Agricultural Society of Scotland. Edinburgh, 1841.

Encyclopädie der gesammten Thierheilkunde. In Verbindung mit mehrern Thierärzten, bearbeitet und herausgegeben von D. Jonathan Braun. Leipzig, 1839-42.

Entertaining such views of the importance of the veterinary art when considered with reference to its own proper and direct aims, and regarding it farther as a valuable occasional auxiliary and elucidator of the facts of human medicine, we are ready to welcome any addition to its stock of literature, which, in our country at least, is far from being exuberantly rich. The works, of which we have given the titles at the commencement of these remarks, have lately come into our hands, and it is now our intention to bring our readers to some slight acquaintance with the value of their contents.

The first volume of Mr Percivall's "Systematic Treatise" was published in 1834. After a lapse of seven years, we have presented to us, completed, a second volume of somewhat more than 400 pages. Other two volumes are still to appear; so that, at this rate of publication, the reader, if he survive as long, may have the pleasure of possessing the entire work somewhere about the year 1855. We trust that this arrangement argues better for the extent and lucrativeness of Mr Percivall's ordinary occupations, than it does for his regard to the convenience of the purchasers of his treatise. For all our sakes, however, we sincerely desire that he may live to complete his labours, and we to receive the fruits of them; even at the risk of his last volume, in a science destined, we are sure, to make a rapid progress, presenting but little affinity with the eldest of the race: *species, ut nec pes, nec caput uni reddatur formæ.* Shortly after the publication of the first volume, we brought its contents under the especial notice of our readers; the following remarks, therefore, will be confined to the parts at present before us.

We are always glad when any department of science admits of being illustrated by statistical details, and when these details are ready at hand to offer us their evidence. There is something so distinctly tangible in the results presented to us in this way, that we perceive at once the true amount of assistance which the science receives from them, and can thus note accurately the stages of its progress towards that perfection which can never be attained by the wavering steps of conjecture and vague assertion. Our author commences his volume by remarking, that "no general fact appears better established in hippo-pathology, than that disease is the penalty nature has attached to the domestication of the horse. So long as the unbroken colt remains at grass, or in the straw-yard, even though he be houseless and shelterless, little apprehension is entertained about his health: no sooner, however, does the time arrive for his domestication, than from the day,—nay, the very hour,—he becomes stabled, do we begin to look for his 'falling amiss;' and so prepared for this event do we feel in our own mind, that, should the animal escape all ailment during this probationary stage of his life, we are apt to regard him as a fortunate exception to what seems to be established as a law of nature." Now, this is an important assertion, and it may be a true one; but it is one which was peculiarly susceptible of being backed by statistical details, and these our author has left wholly wanting. For our own parts, we have too vivid a recollection of the destruction occasionally caused by the various morbid states usually classed under the name of the "colt-ill" (fully described by Braun, *V. Füllenkrankheit*), to acknowledge ourselves so devoid of apprehension as to the health of the unbroken horse, as appears to be the case with Mr Percivall; and we would fain hope, in contradiction to his remark, that there are many facts in veterinary medicine better established than that with the assertion of which he introduces his volume.

The author next proceeds to consider the "distribution of diseases between the growing and adult periods of a horse's life-time;" and as he has already disposed of all question as to the health of the "unbroken colt," we suppose that we must here understand by the "*growing period*," that which elapses from the commencement of domesticity to the completion of the second dentition; or from the termination of the third, to that of the fifth year. This, again, is a topic which admits of illustration by statistical evidence, and here the author has not wholly disappointed us. We extract the following table (slightly altering its form), with the subjoined remarks, from the third page :—

A Table, shewing the comparative Ages at which Horses appear most disposed to certain Organic Diseases.

DISEASES.	Patients under 5 years old.	In their 5th Year.	Above 5 and under 10.	Above 10 and under 20.	20 and upwards.	TOTALS.
Disease of the Lungs,	170	50	20	50	10	300
... of the Bowels,	10	20	40	70	20	160
... of the Brain,	4	2	5	14	2	27
... of the Eyes,	30	10	70	35	5	150
Total,	214	82	135	169	37	637

"From this tabular statement, to the extent that it goes, we learn that pulmonary disorders are more prevalent among horses prior to, and during, the fifth year of their age, the periods of their growth and domestication, than at any subsequent time; after that age they become obnoxious to diseases of the bowels, and occasionally of the brain; and that ophthalmia is a disorder especially prevalent at the adult or most vigorous stage of life." A second table is then given, shewing at what particular seasons of the year certain classes of disease appear to be most prevalent; and from this we learn, that " pulmonary diseases prevail most during the autumnal and winter seasons; that bowel complaints occur oftener in summer than in winter; and that this latter observation is still more applicable to disorders of the brain and eyes.

" The comparative fatality of diseases," he adds, " constitutes yet another link that may be usefully appended to this chain of inquiry. Searching for the deaths, in one of the registers from which the foregoing tables have been compiled, we find,—

Deaths from pulmonary disease, ...	77
Deaths from other diseases (glanders and farcy, and accidents excepted), ...	57

According to this calculation, pulmonary disease carries off more horses than all other maladies besides, setting glanders and farcy out of the computation. It must not, however, be understood, that, because more horses die from pulmonary disease than from all or any other, *ergo*, in reference to the diseases themselves, separately considered, that it is the most fatal; on the contrary, pneumonia is not of itself so dangerous a disorder as enteritis; for were horses as obnoxious to one as they are to the other, more would certainly die from the latter than from the former. The predominance of pulmonary disease, among men as well as horses, is to be ascribed to the variableness of the climate we inhabit, and the continual vicissitudes we are all in consequence necessarily exposed to; against the effects of which it has been found next to impossible to protect our own bodies, much less those of our horses. The proportion of deaths in pulmonary affections is also to be elicited from an adjustment of these computations: it appears in the ratio of 77 to 300, or a fraction more than one in four."

Now, to these remarks on the fatality of diseases, we would wish, especially, to direct the attention of our readers. It will be observed that the number of cases of disease brought under treatment was 637, and that of these, 134 had a fatal termination. The deaths, therefore, were at the rate of 21.03 per cent., or 1 in 4.75 of the whole number. In 300 of the cases, the lungs were the part principally affected, and of these 77 died. The mortality here, therefore, was 25.66 per cent., or 1 in 3.89 of the cases treated. Only 37 of the animals were above 20, and 431 were below 10 years of age. Now, this appears to us to be a prodigious degree of mortality, and one not very creditable to the resources of an art, which, Mr Percivall himself tells us (and we have every anxiety to believe him), is fast rising to the dignity and importance of a science. Let us make an attempt to contrast it with what occurs in human medicine. We have now before us certain returns from 21 of the principal provincial hospitals in England, by which it appears, that the maximum mortality (occuring at Bath) is only 7 per cent. of the whole number of patients admitted; while the minimum (occurring at Cambridge, Salisbury, and Winchester), is so low as 2.50; the average for the whole 21 being 4.33 per cent. In the London hospitals the average is 9 per cent.; but here, keeping in mind the greater unhealthiness of our densely peopled capital, we must also consider, that many of the deaths are from cases of accident, while Mr Percivall's table appears to bear reference to cases of internal disease only. And let it be recollected, too, that the inmates of our hospitals are not, generally, the most favourable subjects for medical treatment. On the contrary, they are of that description which requires a very high degree of skill to produce a high average of success. Always poor, they are also frequently dissipated; and, unless labouring under disease of marked severity, they are not admitted to treatment at all; or, at least, not as in-patients, of which class only we have here taken account. Yet the rate of mortality given by Mr Percivall is nearly five times that of the average of the English provincial hospitals, and more than twice that of the hospitals of London.

We confess that we are ourselves greatly surprised that we should have arrived at this result, but it is the only one which appears to be justified by the facts before us. We would ask, then, if there be any way in which this can be explained? Is there any peculiarity in the constitution of the horse, which renders its diseases more difficult of detection, or more untractable, than those of man? To this the Veterinarian has a ready answer, and one to which neither Braun, Percivall, nor Lawrence has omitted to give due prominency. The horse, they tell us, is dumb. The symptoms it presents, therefore, are merely objective: it can give no voice to its sufferings, no history of its ailments. But the period of infancy is, with regard to sickness, the most troubled term of man's existence; and the infant is dumb as the horse. Still we find, from the computations of Edmonds, Most, Farr, &c., that the average mortality attendant on sickness in children, taken exclusively, is only 11 per cent, or 1 in 9.09 of the cases treated. And this is said of children in hospitals :—of those treated in private practice, the deaths, we are assured, are in a considerably smaller proportion. But let us even take into account all children born, not one of which, we will venture to say, has escaped repeated attacks of illness, though many have never been treated medically. We learn from the Reports of the Registrar-General, that, for every 100 births there are, at an average, 15 deaths within the first year; or that 1 in 6.66 parishes. Still we have here a mortality greatly less than that which Mr Percivall shews to have prevailed among horses. As to other peculiarities which may be pointed out, are they not, many of them, advantages on the side of the horse ? Do not its simple habits, its exemption from all mental causes of depression or excitement, its freedom from the allurements of pleasure or of vice, its state of complete subjection, constitute a precious ground-work for the operations of the Veterinarian ? And if its want of speech do not permit it to disclose all its feelings, its unerring instinct enables it to express much that is sufficiently intelligible ; and it has, at least, nothing which it wilfully conceals. It is safe to say, that instinct, on many points, may be less in error than intelligence.

After the preliminary observations upon which we have offered these remarks, Mr Percivall proceeds to introduce his readers to a knowledge of the diseases of the lungs, the heart, and of the digestive and urinary apparatus. His plan, in describing each separate disease, is carried out in something like the following order. He commences with the etymology of the name, and with a brief definition of the seat, and presumed nature of the affection. Its causes, symptoms, progress, and terminations are next described, and some remarks are made on the prognosis, and, occasionally, also on the diagnosis from other diseases. Its pathological nature is then more minutely examined, and the whole is concluded by the necessary information regarding the treatment. This, our readers will observe, is methodical enough ; but the due sequence is not always very regularly observed, and, in the accounts of some diseases, certain of the heads are either wholly neglected, or turned aside with a very limited degree of attention.

We are sadly puzzled with our author's definitions and classification of the various diseases of the respiratory system. The term *catarrh*, is evidently used as synonymous with *coryza*, and yet *nasal gleet* is separately treated of. Cough occupies the place of a distinct disease, though only a symptom of many varying pathological states, and evidently considered as such even by the author himself. The subject of adhesions of the pleura, too, is introduced long after he has closed the consideration of pleurisy, of which they are an effect. But, indeed, it is this kind of confusion which we feel compelled to complain of as pervading the whole work, and by which its value as a book of reference is greatly diminished. The author's style rather reminds us of an after-dinner chat, than of the close method of a scientific treatise ; and he is loose and discursive, following a hint here, and a surmise there, as chance may suggest, when he ought to be precise, and to proceed cautiously and regularly by rational deduction, in the way which the proper treatment of his subject demands. Such a style is not without its attractions, for it is one which "he that runs may read ;" but the severely logical manner of D'Arboval,* writing on the same subject, is more creditable to science, and better fitted to promote its advancement.

We are not willing to dwell upon mere verbal criticism, but the emoluments of a veterinary surgeon in this country are now on a sufficiently liberal scale, to entitle the public to expect from him that correctness of language which is a sure proof of his early education having been attended to with proper care. Under this view we can scarcely excuse Mr P.

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* The work of Hurtrel D'Arboval, certainly the best extant on Veterinary Pathology, affords a favourable proof of the high state of cultivation to which that science has been brought in the French schools. Copious in its details, which are always presented to us in a well-ordered series, sound in pathology, and judicious as to the rules of practice, we have in it a rich and extensive store of the best facts and doctrines of the art; embracing many new and difficult subjects, such as our English writers have scarcely, as yet, ventured to deal with. It was first published in 1828, in 4 vols. 8vo, and the issue of a second edition enlarged to six volumes has been recently completed. A translation from the later edition is now publishing in Germany.

for such slips as using *they for these; destructibly for destructively; elapse for lapse;* and other petty inaccuracies. Of greater importance are a few contradictions in the statement of simple facts; as at page 253, where he tells us that the pulse in volvulus is "*quick and small;*" and yet at page 255, speaking of the same symptom in the same disease, we are assured that it is *not quick* but soft. This, to say the least of it, is careless, and brings doubt upon the author's precision in other matters, where he may not be so easily detected. Still Mr Percivall appears to us to be a man of acute observation, and, occasionally, of considerable powers of description. As a proof of this, we have much pleasure in extracting the following admirable description of the last stage of a fatal case of enteritis. It is a true and impressive picture, in which no detail is omitted, and in which all are grouped by a masterly hand:—"The next stage borders on delirium. The eye acquires a wild, haggard, unnatural stare; the pupil dilates: his heedless and dreadful throes render approach to him quite perilous; in short, he has become an object, not only of compassion, but of apprehension, and seems fast hurrying to his end; when, all at once, in the midst of agonizing torments, he stands quiet, as though every pain had left him, and he were going to recover. His breathing becomes tranquilized; his pulse sunk beyond all perception; his body bedewed with a cold clammy sweat; he is in a tremor from head to foot, and about the legs and ears has even a death-like feel. The mouth also feels deadly chill; the lips drop pendulous; and the eye seems unconscious of objects. In fine, death, and not recovery, is at hand. Mortification has seized the inflamed bowel: pain can no longer be felt in that which, but a few moments ago, was the seat of exquisite suffering. Should the horse be down at this time, he may still muster strength enough to rise. Again, at the last he becomes convulsed, and, in a few more struggles, less violent than the former, he expires." (p. 246).

The rules of treatment laid down by Mr Percivall are, in general, judicious; and we regard this department of his work with peculiar pleasure, as affording the clearest evidence of that improvement in the art which has been gradually taking place during the currency of the past century, and especially towards its close. We have now before us a book published in 1711, and termed the Complete Horseman or Perfect Farrier, purporting to be chiefly an abridgement of Solleysel's work, with certain additions from "the best authors." This volume contains some recommendations so extraordinary, that we can scarcely believe that little more than a century has elapsed since such things were possible, and even of ordinary application.—For a horse that is "harassed and lean after a long journey" it is prescribed (p. 81)—"If it be a mare, give her a horse, and if she never had a foal before, it will enlarge her belly." For the over stretching "of a sinew," we have the following wonderful application (p. 361)—"Take blood from the shackle veins in the postern, then flea a very fat puppy dog, of two months' old; immediately after he is killed, bruise his flesh and bones together; lay them on a cloth, and bind it close to the sinew strain as warm as you can, having first bathed it with brandy, and taken care to throw away the dog's guts. Some prefer a fat cat used in like manner." In the proposed remedy for a "gaunt-bellied horse," ignorance and cruelty strive fairly for the mastery. "If a horse's belly shrinks up towards his flanks, you may conclude he is very costive, and afflicted with much unnatural heat, and will always be very washy and tender, and very unhealthy after hard labour. In order to cure; you must know that all horses have two small strings, extending from the cods to the bottom of the belly, one on each side. These strings you must break with your fingers, and then anoint the place every day with fresh butter and the ointment *Populeon* mixed in equal quantities." But, in quoting such passages, let us, in justice to the Veterinarian, recollect that these were the days, when the regular physician, prescribing for man, might be found slighting, indeed, the effects of *cranium humanum, stercus anseris et pavonis*, and the *album græcum*, or *stercus canis officinale*, as of little value, though not wholly mistrusted; and yet speaking confidently of common *earth-worms* as "good in inflammations and tubercles of the lungs," and of *stercus equi non castrati* as of "great efficacy in pleurisies;" while the no less delicate *stercus porcinum* was praised as "greatly detersive and diuretic." Alas! for the pride of human reason which could deceive itself, in our predecessors, with such idle and obscene fancies. And alas! for us, if we do not profit by their mistakes, to guard ourselves from too blind a confidence in those doctrines and opinions, which are, even now, in chief favour amongst us.

Taking even the present improved state of veterinary knowledge in this country as our standard of comparison, we are inclined to consider (notwithstanding the somewhat depreciatory tone of part of our remarks) that the work of Mr Percivall will, when completed, be found entitled to occupy a distinguished place as a systematic treatise. But, if we form our estimate of the condition of the science from what we know of its progress abroad, especially in France, we shall be compelled to assign it a much lower position in the general literature of the art. If there be one thing more certain than another, it is that veterinary science is in a more advanced state in France than in this country. If England be the paradise of horses, it is only so of horses that are in health. Caligula's celebrated charger *Incitatus* was scarcely more splendidly lodged, or more carefully watched, than are many of the inmates of our racing and hunting stables, while in the enjoyment of health; yet the same animals, when attacked by sickness, are too often left without compunction to the tender mercies of an ignorant and, therefore, presumptuous groom, or to the care of a farrier frequently little better instructed. They "manage these things better" with our neighbours. Nearly thirty years before the establishment of our Veterinary College in London, that of Alfort was instituted in the rival country; and the same spirit which led to its prior establishment has since maintained its unquestionable superiority. With a greater number of professors than that attached to the English College, a more extended curriculum, and more liberal assistance on the part of Government, the school at Alfort, aided by similar establishments at Lyons, Strasbourg, Montpellier, and Toulouse, has carefully educated, and distributed over the whole of France, and especially to its vast armies, a number of practitioners of qualifications *generally* far superior to those of England. At every chief town of a department, or of an *arrondissement*, Government has sanctioned, moreover, the appointment of a veterinary practitioner of acknowledged skill, to whom it allows a salary from the public funds. Thus, in the person of this individual, there is fixed in every district a kind of standard of knowledge, as nearly as possible at the highest point which the existing state of the science admits. Yet the remuneration, in the shape of pay, received by the French veterinarian for his superior attainments, is very far below that bestowed upon the lower qualifications of the English practitioner. The veterinary surgeon in our cavalry regiments has a pay amounting to nearly L.150 sterling per annum; but the veterinarian-in-chief of the French Royal Guard has only L.60, and his assistant only L.42, until after ten years' service, when the salary of the first is increased to L.72, and of the second to L.54. In the regiments of the line, the chief has only L.48 yearly, and the allowance of his assistant is also lower in proportion. Taking into account the rates of pay of the regular medical officer in our army, we consider that the remuneration of the veterinary surgeon is amply sufficient; but the pay in the French service appears to us to be mean and inadequate, though we have reason to know that the parties receiving it are generally contented with its amount.

We understand that the veterinarians of England have lately addressed a petition to the Queen, praying that they may be invested, as a body, with regular collegiate powers, similar to those possessed by the Colleges of Physicians and of Surgeons; including authority to grant diplomas, without that foreign interference to which they have hitherto been subjected. Should Government see reason to grant this request, we trust that the new charter will be accompanied by other arrangements of a still more extensive description; such as will prove that our rulers are duly alive to the importance of a science, some of the leading tendencies of which we have faintly indicated at the commencement of these remarks. In addition to the College now established in London, we would wish to see others, each with its full complement of teachers, located in the cities of York, Dublin, and Edinburgh. Of the very able Professor already placed in the Scottish capital, under the judicious patronage of the Highland and Agricultural Society, we have no wish to speak in any other than those terms of respect to which we believe him to be entitled; but we are confident that he will not be the last to concur with us in stating, that one Professor cannot constitute a College, any more than one swallow can make a summer; and that he will be eager to assume such worthy colleagues in his arduous and complicated duties as may be presented to him through the influence of more enlarged views of the public interest on this head than those which have hitherto been entertained by the government of our country. To none of these veterinary schools should there be appointed fewer than five teachers or professors, duly provided with all the accessories of lecture-rooms, museums, hospitals, laboratories, forges, &c.; and in no case should a shorter curriculum than four years be admitted as qualifying the student to present himself as a candidate for the diploma. We believe that the expense of such institutions would be saved to the country in a few years, by the additional period of efficiency which they would prove the means of securing to the horses of our cavalry alone, through the influence of improved methods of treatment. At least we learn from the returns of the French army, that something of this kind has occurred amongst our neighbours.

We have left ourselves little space for any consideration of the merits of the other publications, the titles of which we have placed at the head of these remarks. The treatise by Professor Dick was originally published in the Encyclopædia Britannica, where it was of course required of him that he should confine himself to somewhat narrow limits. It presents, however, a concise and judicious epitome of the leading principles of the art, and may be consulted with great advantage by those who aim only at a general knowledge, without dipping minutely into details.

The work of Braun takes a much more extensive range. It is a volume of upwards of 700 closely printed octavo pages, with double columns; and presents a mass of minute and valuable information on every department of veterinary science. His aim has been, as we learn from the copious title, to adapt it as well to the general as to the professional reader, and to render it fitted "for ready consultation, and accurate instruction, as to the best means of maintaining the health and securing the longevity of domestic animals, and of warding off, alleviating, or effectually curing, their diseases." We have read a great part of it with considerable attention, and have been gratified by finding its details generally ample, accurate, and interesting. Its comprehensiveness is truly German; and we believe it would be difficult to suggest any subject connected with the veterinary art, or its allied sciences, on which it does not afford a certain amount of information. A materia medica somewhat loaded with heterogeneous, and often comparatively inert, substances, is the only portion of its varied contents to which we feel inclined to offer any special objection.

THE WORKS OF GEORGE SINCLAIR.

By CUTHBERT W. JOHNSON, Esq., F.R.S., Corresponding Member of the Agricultural Society of Koningsberg, the Horticultural Society of Maryland, &c.

THE exertions made by the Board of Agriculture, soon after its formation, to induce men of science to turn their attention to agriculture, were speedily productive of advantage in many respects to the farmers of our island. These efforts, we have already seen, produced the "Elements of Agricultural Chemistry" by Sir Humphry Davy. And when that great chemist was concluding his valuable volume, he anxiously drew the attention of his readers to the labours of George Sinclair upon the grasses of England, which forms the valuable appendix to Davy's work, observing very truly, that these experiments, conducted with much address and intelligence by Mr Sinclair, stamped a value upon even the "Elements of Agricultural Chemistry." This appendix contained the results of a series of valuable experimental researches long carried on in the grass-garden at Woburn, upon the produce, chemical properties, and the soils on which they best grew, of almost all the indigenous and other grasses of Britain. The celebrated grass-garden at Woburn Abbey, which was formed by the late Duke of Bedford, is described in a recent communication to me from Mr Anderson of Oakley, as being rather more than an acre in extent; all the different kinds of grasses which Sinclair cultivated, it appears, yet remain as they did in his time; they are still kept clean, but the seeds are not now gathered separately as they were, when he had the care of them. "The farmers do not, in general," adds Mr Anderson, "pay sufficient attention to the grass-seed that is required to lay down land for permanent pasture, they are too apt even now to think that a mixture of red and white clover with rye-grass quite sufficient."

The results of these inquiries of Sinclair gradually accumulated, were submitted to the public in several detached forms, and finally constituted the groundwork of the elaborate and invaluable Hortus Gramineus Woburnensis. This noble field of research, upon which George Sinclair, under the direction of John Duke of Bedford, was so long and so successfully employed, was one that had remained, until Sinclair commenced his investigations, almost entirely unexplored. But few grasses were, previous to his time, separately cultivated for their seeds. When the farmer of the last century proposed to lay down any of his land for permanent pasturage, the rudest mode was commonly adopted to procure the necessary seeds. The mere sweepings of hay-lofts were generally used for this purpose. Not the slightest consideration was bestowed upon the quality of the hay from whence those seeds had escaped—no one asked the nature of the land on which that hay grew. The seeds of the grasses, therefore, which naturally tenanted a clay soil, were often sown upon a sand or a chalk, or *vice versa*—those from the sand or the chalk were spread over soils on which, from their habits and chemical composition, they could not possibly flourish. Professor Martyn, indeed, had before this time well described the general state of the limited knowledge of the farmers of his days with regard to the grasses, when he observed (*Letters on Botany*, xiii), "Grass vulgarly forms one single idea, and a husbandman, when he is looking over his enclosure, does not dream that there are upwards of three hundred species of grass, of which thirty or forty may be at present under his eye; they have scarcely had a name besides the general one until within these twenty years, and the few particular names which have been given to them are far from having obtained general use, so that we may fairly assert, that the knowledge of this most common and useful tribe of plants is yet in its infancy." Neither would many farmers, even in our present advanced stage of knowledge with regard to the grasses, readily suspect that the plants of the grasses tenanting our richest meadows were so numerous as they are really found to be upon a careful examination. Sinclair examined *a square foot* of the turf from various pastures, and obtained the following results—*Hortus Wob.*, 244 :—

	Total Number of Plants.	Distinct Species.
From a rich pasture at Endsbigh, in Devonshire, ...	1000	20
From a rich pasture near Croft Church, Lincolnshire, ...	1090	...
From an ancient pasture at Woburn, .	910	12
From a two-year old lay of White Clover and Rye-grass, ...	470	2
From narrow-leaved Meadow-Grass, *Poa Angustifolia*, of six years' standing, at Woburn, .	192	...
From Meadow Foxtail-Grass, . . .	80	...
From Rye-Grass, ...	75	...
From Water Meadow, well managed, . .	1798	...

From these experiments Sinclair drew this important conclusion, " that the smaller the number of different species of grasses that are combined together in a pasture, the greater is the deficiency of plants on any given space of the land."

Of George Sinclair, whose works I propose to examine in this essay, I regret to have, after no inconsiderable labour, so few particulars to communicate.

Almost all that I know of him is derived from his correspondence and his works. He was a native of Scotland, and was, I believe, originally in the service of the Gordon family, from whom, upon the marriage of Lady Gordon with the late Duke of Bedford, he came to Woburn. He had long (seventeen years) the care of the gardens at Woburn Abbey, and afterwards was in partnership with Messrs Cormack and Sons of New Cross, near London, as nursery and seedsman. He died in 1835, in the fifty-second year of his age, and was buried in the Church of St Paul's, at Deptford. I have heard him described by those who knew him intimately, as a mild and honourable man, anxious to communicate knowledge, and neat and accurate in all his attempts.

His great work is the Hortus Gramineus Woburnensis, the first edition of which, in large folio, 1816, was illustrated by real dried specimens of the grasses it describes. I have not seen more than one copy of this scarce edition. It was reprinted in royal octavo, with coloured sketches of the grasses, in 1823 and 1825, and condensed editions have been published in octavo in 1839 and 1841. He also edited a fragment of a work upon the Weeds of Agriculture, by the late Benjamin Holdich, and enriched several of the periodicals of his day by his communications.

In the preface to his chief work, the Hortus Gramineus Woburnensis, he alludes to the history of the introduction of the common grasses. The first mention that he had discovered of the common ray-grass by an English author, appears to be by J. Worlidge, who, in 1681, thus describes it in his "Mystery of Husbandry discovered and laid open:"—"Ray-grass, by which they improve any cold, sour clay, weeping lands, for which it is best, but good also for drier upland grounds, especially stony, light, or sandy lands, which is unfit for sainfoin, hath the precedence of all other grasses; these are sainfoin, lucern, clover, tares, spurrey, and trefoil;" which include all the plants he mentions as grasses. The account of ray-grass thus concludes:—"Four acres of this grass hath yielded twenty quarters of seed, and fourteen load of fodder, besides the spring and autumn, whereon six or eight cattle usually grazed."

There is no account of any other species of perennial grass being cultivated till about forty years since, when meadow cat's-tail was partially recommended for cultivation; and more lately, the culture of cock's-foot has been considerably extended, so as, in some districts, to supersede the use of ryegrass. "Thus, out of 215 distinct species of grasses," adds Sinclair, "which are capable of being cultivated in this climate (many of which differ in value from each other, as much as wheat does from pilcorn), two only have been cultivated separately to any extent. The cause of so much delay in the advancement of improvement in this important branch of the farmer's art may appear extraordinary, but there have been serious difficulties in the way."

In the original copy of this valuable work, the catalogue contained upwards of 320 species of grasses, but in the second, which is the edition I have used for this paper, the proper grasses enumerated amount to above 1500.

The volume is divided into five sections. The first division contains, amongst a mass of other valuable materials, an account of the mode in which the experiments were conducted at Woburn—of the nutritive matter of the grasses—of the soils employed in the experiments—of those best adapted for the growth of the superior pasture-grasses—of the means of improving inferior lands for the growth of the most valuable grasses, &c.

The mode of experimentalizing at Woburn is thus described:—"An extensive collection of the seeds and plants of the natural grasses having been formed in the garden at Woburn Abbey, preparations were made for their culture in such a manner, as to obtain a clear and satisfactory knowledge, founded on facts, of the various properties, habits, and comparative value of each distinct species and variety. Spaces of ground, each containing four square feet, were enclosed by boards in such a manner, that there was no lateral communication between the earth enclosed by the boards and that of the garden; the soil was removed in these enclosures, and new soils supplied, or mixtures of soils were made in them, to furnish as far as possible to the different grasses those soils which seem most favourable to their growth, a few varieties being adopted for the purpose of ascertaining the effects of different soils on the same plant. The nature of these soils was accurately ascertained by analysis. Upwards of 200 species and varieties of grass, were planted or sown at the proper seasons; the different species were cut at certain stages of their growth, and the weight carefully ascertained; the particular seasons at which the different species attained to the greatest degree of perfection were attentively observed, as likewise the time of flowering, and the period of perfecting the seed. Their comparative value, therefore, in regard to produce, and the particular seasons at which it was in perfection, with the kinds of soil most favourable to their growth, and the peculiar habits of the different species, were by these means satisfactorily ascertained."

The next important question, that of the nutritive matters contained in each variety of grass, was next to be ascertained, and this was successfully determined chemically by a process suggested to him by Sir Humphry Davy, results which, there is every reason to believe, agree very closely with the grazier's experience. And during these extended experiments, which are much too copious to give in this journal, Sinclair noted a variety of facts highly interesting to the keeper of live stock: "I have found," he observes, "that some linseed cakes are much more nutritive than others. I have found them to vary from 67 to 132 grains in every 480 grains of cake. Those cakes which had the brightest texture when newly broken, afforded the most nutritive matter. The common field-turnips also differ in the quantity of nutritive matter they afford, which is in proportion to the size of the roots, or according as their texture is solid or spongy. The largest roots contain proportionally the least quantity of nutritive matter, and the middle-sized the greatest. These are minute circumstances in experiments on a small extent, but when conducted on a large scale, they become objects of magnitude."

These researches into the nutritive matters of different plants were extended, and supported by an examination, not only of the food on which the animal subsisted, but by a careful analysis of the insoluble and other matters it voided. Thus, he found that 1920 grains of the yellow Scotch turnip on which sheep were feeding afforded 85 grains of nutritive matter, which was composed of mucilage, 3 grains; saccharine matter, 73 grains; bitter extractive and saline matters, 3 grains. Upon an examination of the dung of the sheep which fed upon these yellow turnips, it was ascertained that 1920 grains afforded 85 of soluble matter, which consisted of animal mucus and mucilage, 3 grains; bitter extractive and saline matters, 14 grains.

It early attracted the attention of Sinclair that one great cause of the continued supply of feed, furnished by the rich meadow-lands of England, arises in a great measure from the variety of successive grasses, all of different habits, with which they are tenanted. He gives, therefore, at p. 32, a valuable Table of the periods at which the different species ripen their seeds, extending from the *Poa annua*, or annual meadow-grass, which begins to ripen its seeds about the 10th of April, to the *Triticum rigidum* or stiff wheat-grass, which does not perfect its seeds until about the first or second week in October. From this Table, he shews that the essential grasses ripen their seeds at three different periods of the year, forming three divisions or groups, the first or earliest species perfecting their seed about the end of June, the second about the end of July, and the third about the first and second week in September. Another great advantage of mixing together different varieties of the grasses in the same land, is most probably to be accounted for by the different nature of the excretions which they deposit in the soil, which excretory matters have been proved in some plants to be peculiarly grateful to those of a different species, and to promote their growth, although distasteful to those of the same kind. Sinclair seemed to have noticed this effect without having had an opportunity of inquiring into the cause. For when inquiring into the best modes of procuring a supply of the different grass seeds, he remarks,

—"The unconquerable propensity of almost every species of the valuable grasses to combine and grow in company with others, renders every attempt to cultivate them singly for any length of time impracticable, without, at the same time, incurring considerable expense in weeding, separate reaping, harvesting, and winnowing." And where, at p. 162, he is describing the *Avena flavescens*, or yellow oat-grass, he remarks,—"This is one of those grasses which never thrives when cultivated by itself. It requires to be combined with other grasses to secure its continuance in the soil, and to obtain its produce in perfection. It thrives best when combined with the meadow barley, crested dog's-tail, and the sweet-scented vernal grass." He notices, at p. 39, a very ingenious mode for procuring the seeds of the Down grasses, or of those peculiarly adapted for elevated dry soils, a plan originally suggested by Mr Blakie. It consists in merely fencing off a portion of these pastures for seed, and mowing them at three or four different periods of the year, by this means, the seed is secured of the different grasses which ripen their seeds at several periods of the year, and, in consequence, when these mixed seeds are sown on similar lands, a turf is produced much more nearly resembling the natural Down land than could possibly be procured by sowing the seeds procured from only one mowing. At the conclusion of this section, after explaining that the most productive old pasture lands, under very different management, still produce the same grasses,—dry elevated soils, a different class of grasses of inferior merits,—and wet and peat soils, a still different variety of the grasses, he concludes that the merits of the different grasses natural to such situations, will be much more readily seen if every species is considered under its own particular soil, and in conjunction with those which are naturally combined with it. And, in furtherance of this arrangement, he proceeds, in section 2, to examine the grasses and other plants which constitute the produce of the richest natural pastures. The grasses and other plants which compose the turf of the richest natural pastures, are about twenty-six in number; and each month, except those of winter, is the peculiar season of luxuriance for one or more of these grasses; and hence, says Sinclair, proceeds the constant supply of rich succulent herbage throughout the season, a circumstance which seldom or never occurs in artificial pastures, where the herbage consists of two or three plants only. If the best natural pastures are examined with care, during various periods of the season, the produce will be found to consist of the following plants, which afford the principal grass of the spring, and a portion of the summer produce, viz. meadow foxtail, round cock's-foot, meadow fescue, meadow cat's-tail, sweet-scented vernal grass, tall oat-like soft grass, creeping vetch, rye-grass, field brome-grass, annual meadow or Suffolk grass, and the meadow oat-grass. Those grasses which yield the herbage of summer and autumn, are the yellow oat-grass, meadow barley, crested dog's-tail, hard fescue, rough-stalked meadow-grass, smooth-stalked meadow-grass, woolly soft grass, perennial red clover, white or Dutch clover, yellow vetch or meadow-lathyrus, and the smooth fescue. While those whose produce is the most abundant in autumn, are the yarrow, creeping bent or fiorin, the marsh bent grass, and the creeping wheat-grass or couch. The difficulty with which a rich old pasture, when once ploughed up, is restored to its former state, was a fact too interesting to escape the attention of Sinclair. He examined the question in several ways; first, he noted the nature and habits of the grasses which compose the turf of these rich meads, and then he remarks,—"Grasses, like all other vegetables, possess a peculiar life in which various periods may be distinctly marked. Some species of grass are annual, or arrive at perfection in one year, and then die away, as different species of brome-grass, foxtail-grass, rye-grass, oat-grass, &c. Other species, in two or three years, attain to that degree of perfection, which they never exceed, as perennial rye-grass, rough-meadow-grass, meadow cat's-tail grass, tall oat-like soft grass, round cock's-foot grass, &c.; and there are but few grasses that require more than three years to bring them to that state of productiveness which they never exceed; meadow fescue, meadow foxtail, meadow barley, smooth meadow-grass, and meadow oat-grass, are of this number. These facts, he adds, obtained from the results of experiments and attentive observation, made on these grasses when cultivated singly, and also when combined with others, as in their natural places of growth, offer sufficient proofs to decide that it is not to the great length of time they require to arrive at perfection, that the want of success in attempts to renew rich pastures is to be imputed."

The next suggestion which occurred to Sinclair, on this important question, was, whether, by a course of cropping, the soil of such a pasture was chemically altered in composition, and this he proceeded to examine experimentally with his usual neatness and patience. "The results of one of these experiments," he modestly remarks, "I may be permitted to detail. A space of two square yards of rich ancient pasture land was dug to the depth of the surface soil, which was eight inches, and removed to a place more convenient for making the experiment, but placed on a subsoil of the same nature as that on which it was before incumbent. Three inches from the bottom of the mass were first placed on the subsoil, and the turf was then reversed on this to the depth of five inches; this mode was adopted to place the ground under circumstances as similar as possible to that of ploughing it five inches deep in the usual manner of breaking up pasture land. 400 grains of this soil, freed from moisture, and the plants of grass, were found to contain—

	Grs.
Calcareous and siliceous sand,	102
Decomposing vegetable matter,	55
Carbonate of lime (chalk),	160
Silica, or earth of flint,	50
Alumina, or pure earth of clay,	25
Oxide of iron,	4
Soluble vegetable matter, and sulphate of lime, or gypsum,	4

"The soil was then cropped for five seasons alternately with *1st*, oats, *2d*, potatoes, *3d*, wheat, *4th*, carrots, *5th*, wheat, and to the end that it might suffer, as much as could possibly happen, under ordinary circumstances, by an impoverishing or injudicious rotation of annual crops. Every trace of the turf was by this time entirely lost in the general mass of the soil, which was again examined to ascertain the change it had undergone by these crops. Its analysis gave the following results from 400 grains:—

	Grs.
Calcareous and siliceous sand,	100
Decomposing vegetable matter,	48
Carbonate of lime,	159
Silica,	57
Alumina,	26
Oxide of iron,	5
Soluble vegetable and saline matter,	3

"This analysis shews that very little if any change had taken place in the constitution of the soil, in respect of its earthy ingredients, but a very considerable diminution of its organic matters had occurred, particularly when it is considered how great an addition had been made to the original proportion it contained of this portion of the land, by the turf which was incorporated with the soil." This experiment was then extended by dressing the land thus impoverished of its organic matters, with a copious supply of decomposing spit manure, and sowing it with a judicious mixture of grass seeds. A turf was speedily formed, and the produce exceeded that of the old turf exactly in the proportion of nine to eight; and hence, the cultivator will be disposed, I think, very readily to agree with Sinclair in his conclusion, "that a five years' course of the more impoverishing annual crops, may be taken from land of the nature before described, without unfitting it for the reproduction of the superior natural grasses."

At p. 134, Sinclair commences that extensive examination of the grasses which composes the greater portion of his invaluable volume. A description of a single grass, the *Anthoxanthum oderatum,* or Sweet-scented Vernal grass, will give those unacquainted with the work, an idea of the laborious nature of his experiments. He says,— The produce per acre of herbage, from a brown sandy loam with manure, on the 1st of April, is—

	lbs.		
The produce per acre of grass, . .	3488	0	0
Do. do. nutritive matter, .	95	6	0
At the time of flowering.			
The produce per acre of grass is	7827	3	0
Do. do. when dry, . .	2103	0	14
Loss by drying, ...	5723	10	2
Nutritive matter, ...	122	14	12
At the time the seed is ripe.			
The produce per acre of grass is	6125	10	0
Do. do. when dry, . .	1837	11	0
Loss per acre by drying, ...	4287	15	0
Produce per acre of nutritive matter, . .	311	1	1
The weight of nutritive matter which is lost by taking the crop while the grass is in flower, exceeding one half of its value, is . .	188	12	5

"The proportional value which the grass, at the time the seed is ripe, bears to that at the time of flowering, is as 13 to 4. The produce of the latter-math is—

	lbs.		
Of grass per acre, ...	6806	4	0
Containing of nutritive matter, ...	239	4	8

"The proportional value which the grass of the latter-math bears to that of the seed crop, is nearly as 13 to 9, and the proportional value or nourishment contained in the autumn grass, exceeds that of the first grass of the spring, as 9 to 7."

It is very probable, from some observations of Sinclair, that the nutritive matter of the same grass, grown on different soils, varies much more considerably than is commonly supposed, and that, in some instances, the increased amount of the nutriment compensates in a great measure for the smallness of the bulk of grass produced. In some experiments upon the *Holcus avenaceus*, or tall oat-like soft grass, he found that its produce on equal spaces of different soils, from the time it was sown April 23, 1813, till the period it was cut July 10, 1813, being less than three months, was as follows :—

	Grs.
From a rich clayey loam, 25 or 64 dr., which afforded of nutritive matter,	73
From a clayey loam, 23 or 64 dr., affording of nutritive matter,	84
From a rich black siliceous sandy soil, 13 or 64 dr., which yielded of nutritive matter,	89
From a poor siliceous sandy soil, 10 or 64 dr., affording of nutritive matter,	80
From a heath soil, 8 or 64 dr., yielding of nutritive matters,	83

This great difference in the quantity of nutritive matter afforded by the produce of these different soils, Sinclair thought arose entirely from the proportion of culms contained in the different crops, that from the rich black siliceous soil, for instance, containing by far the greatest proportion of flowering culms, and that of the rich clayey loam the least.

In judging, too, of the nutritive properties of any particular grass, it is very desirable, as Sinclair first pointed out, that the produce of the whole season should be ascertained, and not merely one particular crop. In this way he found the entire produce of the fiorin, or larger creeping bent, afforded, for the whole season, per acre, of nutritive matter, 1435 lbs.; the cock's-foot grass, 1728 lbs.; the meadow fescue grass, 1719 lbs.; and the meadow foxtail grass, 1216 lbs.

After having, through 231 pages, laboured hard to explain to the farmer the habits and qualities of the grasses commonly found in the richest natural pastures, and after having accompanied his descriptions with numerous coloured etchings, he thus sums up his accurate and copious details :—

> "The grasses and other plants that have now been submitted to the better judgment of the reader, comprehend all the grasses and plants which the author could ever find in the *body* of the richest natural pastures, although examined, at least, every month of the year. Some other species, it is true, were sometimes found on particular spots, but could not, from their local situation, be considered as naturally belonging to

such. To those who may have perused and bestowed some consideration on the foregoing details, it may be unnecessary to observe that the facts and observations there brought forward, offer sufficient proofs that it is not from one or two, but from a variety of different species of grasses that the agriculturist can hope to form, in the shortest space of time, a sward equal, if not superior, to that of the richest natural pastures." And he adds a few truths which it would be well, if in other questions relating to agriculture, the cultivator always remembered. "Hastiness in generalizing from a few facts only, in things pertaining to the properties and cultivation of plants, has often led to error; it seldom benefits the cause it was intended to advance; every one is told that this plant, or that mode of cultivation, will best suit his purpose; most make trial, and from the want of that caution which generalization in the outset destroys, the majority fail: this leads to a difference of opinion, and to a contempt of that which, when taken in its limited sense, would have produced every advantage the object was capable of affording. The hope of discovering a single grass, or mode of cultivation, superior to every other, for all the purposes of the agriculturist, under every circumstance, would surely be as rational, and the discovery, when effected, as great, as those of the philosopher's stone, and the universal specific. It appears, indeed, most unaccountable, that at this day, when the different branches of practical agriculture are so well understood, it should be asserted, and without contradiction too, that it is of no importance what kind of grasses are sown upon lands for the purposes of permanent pasture, as nature itself, in the course of time, will produce those kinds of grasses best adapted to the soil, and which only remain permanent. Now, as the whole art of cultivating plants is nothing more than *assisting* nature in the process of the growth of vegetables, surely the above doctrine can amount to nothing more than the confession of an utter deficiency in the knowledge of the art of assisting nature in the process of clothing the soil with its natural perennial grasses; or that instead of three or four years, in the course of which, by the kind assistance of art, the valuable sward may be renewed; it is better to leave it to the slow unassisted efforts of nature, to be renewed in eight, ten, or twenty years."

The difference in the nutritive properties of the various ordinary meadow-grasses, a question of peculiar interest to the grazier, were examined by Sinclair, with much accuracy —he found that in the beginning and middle of April, 1920 grains of the following grasses and other plants afforded of nutritive matter:—

	Grs.
Meadow foxtail grass,	96
Tall oat-like soft grass,	120
Sweet-scented vernal,	52

	Grs.
Round-panicled cock's-foot,	80
Perennial rye-grass,	70
Tall fescue,	94
Meadow fescue,	96
Crested dog's-tail,	88
Woolly soft grass,	80
Creeping soft grass,	90
Meadow cat's-tail,	80
Fertile meadow-grass,	70
Nerved meadow-grass,	76
Smooth awnless brome-grass,	84
Wood meadow-grass,	68
Smooth fescue,	70
Long-awned sheep's fescue,	102
Darnel-like fescue,	110
Creeping bent, or fiorin,	42
Wood fiorin,	62
Yellow vetch,	40
Rough-stalked meadow-grass,	80
Broad-leaved red clover,	80
White or Dutch clover,	64
Common quaking grass,	54
Greater bird's-foot trefoil,	60
Long-rooted clover,	76
Lucern,	90
Burnet,	100
Cow-parsnip,	90

These nutritive matters consist, according to Sinclair, of the following substances :—

100 Grains of the Nutritive Matter of the	Mucilage, or Starch.	Sacch. Matter, or Sugar.	Gluten.	Bitter Extractive and Saline Matters.
Meadow foxtail consist of	64	8	–	28
Meadow fescue	59	20	–	20
Rye-grass	65	7	–	28
Meadow cat's-tail	74	10	–	16
Cock's-foot	59	11	–	30
Meadow oat	80	10	–	10
White clover (in flower)	77	2	7	14
Red clover (ditto)	79	8	5	8
Tares	68	25	–	7
Fiorin (*Agrostis stolonifera*)	55	5	–	40

Of his examination of the entire herbage of three or four commonly cultivated grasses and tares, the following are the results :—

3000 Grains of the Green Herbage of	Woody, or Indigestible Fibre.	Water.	Nutritive Matter.
Tares consist of	557	2250	193
White clover	470	2430	100
Cock's-foot grass . . .	1135	1740	125
Meadow fescue . . .	1260	1590	150

The proportions in which the seeds of the different species of grass should be mixed for permanent pasture, Sinclair thought should be as follows :—

Cock's-foot grass, ...	2	bushels.
Meadow fescue, ...	2	...
Meadow foxtail grass, ...	2	...
Rough-stalked meadow-grass, ...	2	...
Tall oat-like soft grass, ...	0½	...
Meadow cat's-tail, ...	15	lbs.
Hard or smooth fescue, ...	2	bushels.
Crested dog's-tail, ...	1	...
Nerved meadow-grass, ...	0½	...
Wood meadow-grass, ...	1	...
Narrow-leaved meadow-grass, ...	0¼	...
Fiorin, ...	0½	...
Rye-grass, ...	1	...
White or Dutch clover, ...	15	lbs.
Bush vetch, ...	0½	...
Sweet-scented vernal grass, ...	0¼	...
Perennial red clover, ...	12	lbs.
Yarrow, ...	4	...

He was evidently of opinion that the quantity of grass-seeds, commonly applied to the land intended for permanent pasture, is much too small, for the proportion of seeds he recommends is generally large, when contrasted with the proportions recommended by the Messrs Gibbs and other eminent grass-seedsmen. A practical farmer recommends for such soils, in a recent agricultural periodical, the following mixture :—

	On Light Soils.	On Heavy Soils.
	lbs.	lbs.
Clover, red	4	5
— white	5	6
— red, perennial (cow-grass) . .	3	4
Rye-grass, perennial	3	4
— Italian	3	4
Meadow foxtail	2	2
Cock's-foot	4	5
Fescue (meadow)	2	3
— (hard)	2	1
Rough-stalked meadow-grass . . .	1	2
Smooth-stalked meadow-grass . . .	2	1
Wood meadow-grass (Hudson's Bay grass)	3	4
Sweet-scented vernal grass . . .	2	2
Timothy-grass	2	4
	38	47

Sinclair, however, had many strong arguments in favour of thick sowing—and the following observations, which he offers towards the conclusion of the valuable section on the grasses which belong to permanent pastures, contain much that is highly interesting to the cultivator.

"An examination of the most productive pastures shews, that when from twelve to twenty different species of grasses are intimately combined together, six or seven plants to the square inch of surface are not too many. The turf from an irrigated meadow afforded the greatest number of plants, being twelve plants to a square inch. The predominant species in this turf was the *Poa trivialis*, or rough-stalked meadow-grass, the seedling plants of which are small, and, along with the plants of *Bromus arvensis*, or field brome-grass, derive their support in irrigated meadows, more from the water than the soil. Few of the roots of these species had much hold of the ground, and a great number of the plants were rooted merely amongst the crowns of the roots of the other species of grass which composed this turf. The statements brought forward relative to pastures artificially formed of rye-grass and clovers, and those facts connected with the number of plants of grasses which are found to occupy a given space of ground, when one species only of grass is cultivated by itself, prove clearly that much less seed is required to form an artificial pasture of one or two species of grass, than is required to form a pasture for permanency, whose properties of produce, and value, shall equal or approach to that of the best natural pastures. The artificial pasture of rye-grass and clover I have already mentioned in this work, had been made by sowing one bushel of seeds, viz., three pecks of rye-grass and one peck of white clover and trefoil, three plants to the square inch were produced by that quantity of seeds; and had more seed of the same species of grass been used, it is more than probable, from the above facts, that the pasture would have suffered rather than benefited by it; but had there been used the seeds of a variety of different species of grasses, double the quantity of seed might have been used, and the value or productiveness of the pasture increased in the same proportion. I have sown the seeds of the same grasses in every month of the year, January excepted, and though much depends on the weather and the state of the ground, the results were always in favour of the month of September and the beginning of August, and next to that the middle or latter end of May, according as the weather was dry. When land is to be sown for permanent pasture, no admixture of any annual or grain-crop, or broad-leaved clover, should be admitted with the grass-seeds. Experience proves that they retard the formation of a solid productive sward, and that the profit which may accrue from a grain-crop thus obtained, will be much overbalanced by the crop of grass in the two following seasons."

The third section of this work is devoted to a description of the different grasses, and other plants which are natural to dry, sandy, and elevated soils.

In commencing this chapter, Sinclair felt that he now approached the consideration of a variety of grasses indigenous to soils, more difficult to encounter successfully than any he had hitherto described in his work. After giving a list of those which are the natives of such lands, he adds—"Dry elevated situations, sandy heaths, and chalk lands, where the above grasses constitute the principal natural herbage, are less capable of being rendered fit for the production of superior grasses, than peat-bogs or waste lands, that lie under circumstances favourable to irrigation. The latter only require proper draining, paring, and burning, and the application of manures, such as lime or sand, to fit them for the production of the best grasses, the staple of such soils being rich and good. But dry sandy soils require more labour and expense to bring them near in some degree to an equivalent state of productiveness, which can only be effected by the application of large quantities of clay, and by mixing it minutely with the soil. But though poor sandy soils cannot economically be improved in such a degree as to fit them for the production of the superior grasses like peat-soils, which, in their natural or unimproved state, are even less valuable than the poor sandy soils; yet there is sufficient evidence from practice to prove that such soils may be converted to tillage for some years, and returned again to grass, in a highly improved state, yielding a produce of double the value of that they originally afforded."

For those sandy soils which have been improved by claying or marling, Sinclair recommends as the best the following mixture of grass seeds :—

Barley-like sheep's fescue,	3 pecks.
Cock's-foot grass,	3 —
Crested dog's-tail grass,	1 —
Yellow oat-grass,	2 —
Rye-grass,	1 —
Flat-stalked meadow-grass,	1 —
Various-leaved fescue,	1½ —
Hard fescue	2 —
Lesser bird's-foot trefoil,	1 lb.
White clover,	3 —

The results of all the experiments of Sinclair on light sandy soils tended to confirm him in his opinion of the superiority of mowing rather than depasturing seedling grasses the first year:—

> "Oxen (he says) are liable to poach the surface, and horses and sheep weaken the seedling plants by croping too near the roots. Sheep are evidently the least hurtful. By frequently rolling the surface and mowing the produce, the young plants establish themselves better in the ground, and all the plants raised are preserved ; but by leaving the plants to perfect their seed the first year, and excluding cattle, the young plants are deprived of the benefit of the manure supplied by the sheep, which at this stage of the growth of seedling grasses is more particularly valuable on a soil of this nature, than on rich ancient pasture land ; as the roller, when used judiciously, presses the droppings into the surface of the ground, and brings the manure into contact with the fibrous roots of the plants. It is evident, however, that all the benefits accruing to the plants from depasturing the first year, may be supplied by a top-dressing in autumn and spring, and by a liberal use of the roller when the ground is in a suitable state to be benefited by it. A top-dressing should never be applied without sowing some of the seeds along with it, once sowing will never be found efficient to form the most valuable sward in the shortest space of time, on a light dry sandy soil." And he adds in conclusion—"No stock should be admitted to seedling grasses till after the time of their coming into flower."

The fourth section of the *Hortus Gramineus Woburnensis* is devoted to a description of the grasses which grow in moist soils, or in bogs, lands that are periodically overflown, and irrigated meadows.

He commences by laying down the very correct axiom, that all the superior pasture grasses will thrive under irrigation, provided the water meadow be properly constructed,—that is, if the water be placed perfectly under command, so as to be admitted on the land, and carried off at pleasure.

It is impossible to follow Sinclair through the mass of valuable matter which forms this section, without being impressed with the great fund of common sense which peeps out under the description of every grass. His industry will be apparent to every one who examines this laboriously composed work. Sinclair had a just sense of the value of water meadows to the farmer, and he allowed no opportunity to escape without strenuously drawing his attention to their importance. I cannot but be of opinion that the construction of such meads, either supplied with water from natural sources or by the aid of machinery, might be in many situations very materially extended. Our author thus briefly states some of their advantages to the farmer:—"From numerous statements published by those who have made these improvements, the expense of forming land into water meadows appears to be from four to twenty pounds per acre, varying according to the local circumstances under which the improvement is made. The yearly expenses for repairs appear likewise to be from three to nine shillings per acre. The value of such lands by these means has been increased from one to twelve shillings (their original value) to forty and sixty shillings per acre. But when connected with a breeding flock of sheep, the advantages derived from these meadows are hardly to be estimated, for they produce a full bite of grass at least three weeks earlier than the common pastures, and that at a season when every other kind of food is scarce."

The experiments of Sinclair with regard to the comparative nutritive powers of the grass grown on irrigated meadows, confirmed the very common opinion entertained by the farmer, that such grass is rather inferior in value to that produced on dry upland pastures. He found that rye-grass (*Lolium perenne*) at the time of flowering, taken from a water meadow that had been fed off with sheep till the end of April, afforded, of nutritive matter, 72 grains. The same weight of this grass, taken from a rich old pasture that had been shut up for hay about the same time, afforded, of nutritive matter, 95 grains. The same grass from the meadow that had not been depastured in the spring, afforded 100 grains. That from a rich pasture which had not been depastured, afforded 120 grains.

It would seem, from the very valuable comparative researches of Sinclair, upon the grasses produced in situations where their growth was unnaturally forced, and where they vegetated in the ordinary way, that great quickness of growth is commonly attended with a perceptible diminution of nutritive power.

"A water meadow," says Sinclair, "may be said to be a hot-bed for grass. The rapidity with which vegetation advances by the process of irrigation, justifies the comparison. The small deficiency of nutritive matter, in water meadow hay, is what might be expected from such a cause. We find the same result exemplified by daily experience in the instances of esculent vegetables that are forced beyond their natural habits. The same effects are produced by an excess of manure. * * * On a spot in a field of artificial pasture, where a large portion of cow-dung had been accumulated, the grass was extremely rank, and of a very deep green colour, distinguishable from the rest of the rye-grass pasture at a considerable distance. Four ounces by weight of this luxuriant tuft was submitted to experiment; it afforded, of nutritive matter, 72 grains. The same quantity of grass, from a moderately rich soil, which surrounded this luxuriant patch, afforded 122 grains. In another trial, the same species of grass produced on a soil entirely destitute of manure, afforded 95 grains. On the same soil, excessively manured, the grass afforded only 50 grains. Common quaking grass, on a soil moderately enriched, afforded 14 ounces of grass, the given weight of which contained, of nutritive matter, 90 grains. On a poor siliceous sandy soil, incumbent on clay, it afforded 16 ounces of grass, the given weight of which afforded 80 grains. From a soil consisting almost of pure clay, the produce of grass was 12 ounces, the usual weight of which afforded, of nutritive matter, 69 grains. The produce of the tall oat-like soft grass (*Holcus avenaceus*), from a clayey loam moderately manured, was 23 ounces of grass; the given weight of grass contained 84 grains. From a soil almost pure clay, the produce of grass was 13 ounces, four of which afforded, of nutritive matter, 89 grains. From a siliceous sandy soil, with a small portion of manure, the produce was 10 ounces of grass; the given quantity afforded 80 grains. From a heath soil, the produce of grass was 8 ounces, 4 of which afforded, of nutritive matter, 83 grains. In all these trials, the grasses were of the same age (two-year-old plants), and submitted to the chemical process at the same stage of growth."

The copious directions which Sinclair gives at the end of this section, for the formation of water meadows, are sound and practical.

The fifth section of Sinclair's book includes the different grasses, and other plants adapted for the alternate husbandry. In commencing his investigations upon this highly important class of vegetables, Sinclair saw very clearly that such an inquiry comprehended many important objects deeply interesting to the farmer, such as the rotation of crops, and the cause of one crop exhausting the soil more than another. He made these questions, therefore, the preliminary portion of this division of his work, and explored this but little previously trodden path, with all the tact and industry of a cultivator, whom the great Davy had praised and instructed. He very truly told the farmers of his day, that the "grasses and other plants best fitted for alternation, as with green crops with grain, are such as arrive at perfection in the shortest space of time, or within the compass of two years, such as have their leaves broad and succulent, and that do not quickly run to seed. Plants of this kind are supposed to produce the greatest weight of herbage, at the least expense to the soil."

"It is a curious and well known fact," he adds, "that any species of plant that has continued till the period of its natural decay on a particular soil, cannot be again immediately reared with equal success on the same spot, till some other crop intervene; but that a *different* species of vegetable will there succeed better, for its peculiar period of life, than it would on a soil naturally better adapted to its growth, where the same crop had just attained to perfect maturity. This holds good with respect to annual plants, as well as to those that continue to live many years. But it is better seen in the former, as their habits and duration in the soil are oftener and more directly within the reach of common observation. On this antipathy of plants seems to depend the theory of alternate cropping with green crops and grain, varying in some measure according to the circumstances of soil and climate; but the principle appears to remain the same. On analyzing a soil, immediately before and after producing an impoverishing crop, the results of such analysis do not point out any diminution in the weight or proportion of its constituents, sufficient to account for the weight of vegetable matter produced. The decomposing animal and vegetable matters of the soil are the only constituents wherein a sensible loss is perceived."

Sinclair was aware of the mode suggested since his time by M. Macaire and others, to account for this phenomenon, viz. the excretory matters deposited in the soil by plants; for, he adds, "Some have supposed that this antipathy of plants arises from their roots depositing a noxious matter in the soil. And, according to the experiments of M. Burgmanns, oats are thus benefited by the field saw-wort, wheat by the blue erigeron, flax by the corn-scabious and the purple spurge, and buckwheat by the corn-spurry."

Some useful information on this very interesting point may probably be drawn from facts obtained by daily practice and observation in the garden, and in the field, thus—

	Of Green Food in lbs.	Of nutritive Matter in lbs.
Mangel-wurzel produces, per acre, upon suitable soil,	56,000	3120
Carrots,	24,640	2640
Potatoes,	33,600	4800
The common white turnip,	35,840	1638
The Swedish turnip,	29,120	1830
The cabbage,	56,000	3440
Kohl rabi,	31,360	1881

If the soil, therefore, impoverishes the soil in proportion to the weight of vegetable substance it produces, the following will be the order in which the plants just mentioned exhaust the land, being the proportion which they bear to each other with respect to weight of produce.

Mangel-wurzel,	25
Cabbages,	25
White turnips,	16
Potatoes,	15
Kohl rabi,	13
Carrots,	11

Experience, however, has long since proved, that carrots exhaust the soil in a much greater degree than white turnips, though, by this mode of judging, they impoverish land in a less degree than any of these plants. But when we take the weight of nutritive matter which a plant affords from a given space of ground, the results are very different, and will be found to agree with daily experience in the garden and on the farm. The following is then the proportion in which they stand to each other in respect to the weight of nutritive matter which they produce per acre, and in exhausting the land—

Potatoes,	63
Cabbages,	42
Mangel-wurzel,	28
Carrots,	24
Kohl rabi,	17
Swedish turnip,	16
Common turnip,	14

The effects, continues Sinclair, of some plants are only to impoverish the soil for an immediate succession of the same plant, while others have the property of exhausting the land, not only for an immediate succession of themselves, but also of every other kind of vegetable. A consideration of the difference in the composition of the component parts of the different species of plants, will account in some measure for this property. The nutritive or soluble matter of vegetables consists for the most part of five distinct vegetable substances—mucilage or starch, saccharine matter, gluten or albumen, and bitter extractive or saline matters. A plant, therefore, whose nutritive matter consists of one or two of these principles only, will impoverish the soil in a greater degree for an immediate succession of the same plant than a different species of vegetable that has its nutritive matter composed of a greater variety of these substances,—hence plants that have the greatest dissimilarity in the number and proportion of vegetable principles which constitute their nutritive matter, will be found best fitted to succeed each other in alternate cropping. The different varieties of wheat consist almost entirely of starch and gluten, while barley, peas, and turnips, contain a greater proportion of saccharine matter, which is wanting in wheat, and are consequently best qualified to precede or follow that grain in alternation with green crops. Oats, rye, and beans, afford nutritive matters similar to wheat, though in less proportion, and a crop of either of these will have a like effect on the soil to that of wheat, though in a less degree, but totally different from those of barley, peas, and turnips. The former plants, therefore, as they impoverish the soil only for an immediate succession of themselves, may be termed partial impoverishers; and the latter, exhausting the soil for themselves, as well as in a degree for every other kind of vegetable, may be called *general impoverishers.* If the nutritive matter of the following plants be examined with this view, they will be found to rank either as general or partial impoverishers.

General impoverishers.	Partial impoverishers.
Oats,	Wheat,
Rye,	Pease,
Potatoes,	Beans,
Carrots,	Turnips,
Mangel-wurzel,	Clover,
Cabbages,	Sainfoin,
Kohl rabi,	Lucern,
Kohl rabi	Grasses, when mown.

Sinclair perceived very clearly the importance of ascertaining the comparative soluble or nutritive matters in the ordinary food of live stock, and in the notes to his elaborate work, he gives the composition of many substances consumed by animals—from his experiments upon turnips,—

64 dr. of the Swedish turnip afford, of nutritive matter,		110	grains.
64	... ... stone or garden turnip, . . .	85	—
64	... ... common or white loaf, . . .	80	—
64	... ... tankard or long-rooted, . . .	76	—
64	... ... Norfolk white turnip, ...	83	—

The quantity of nutritive matter contained in different roots of the same variety, he observes, varies according to the size and texture of their substance. A root of the white loaf variety, measuring seven inches in diameter, afforded only seventy-two grains and a half, while the same quantity of a root, which measured only four inches, afforded eighty grains. The middle-sized roots of the common turnip are therefore the most nutritious; as, on the contrary, are the largest roots of the Swedish turnip, which afford 110 grains, while the middle-sized and smaller roots afford 99 only. Sinclair also examined the nutritive matters of the cabbage-tribe,—he found in one pound or 7000 grains of the

	Nutritive Matter.	Woody Fibre.	Water.
Cattle or drum-headed cabbage, ...	430	280	6290
The early York, ...	430	312	6258
The Woburn kale, ...	438	932	5632
The green curled kale, ...	440	880	5680
The purple borecole, ...	448	1120	5432
The turnip-rooted cabbage, ...	400	320	6280
The turnip-rooted cabbage, ...	252	360	6396

In his analysis of the different varieties of the potato, 64 dr. of each variety afforded, of nutritive matters,—

The yam potato, ...	190	grains.
The ox noble, ...	195	—
The purple red potato, . . .	200	—
The hundred-eyed variety, . . .	218	—
The rough red variety, . . .	250	—
The champion, ...	260	—

In the Appendix to the Hortus, Sinclair describes at some length the mode of forming a pasture, by transplanting turf or inoculation, a mode of speedily creating a pasture from tillage land, first introduced by Mr Whitworth of Acre, in Lincolnshire; and in a second appendix, treats of the grasses which afford the best culms or straw for the manufacture of straw-bonnets. From the facts which he there brings forward, he is led to the conclusion, that "the manufacture of straw-bonnets may be brought to a greater degree of perfection in England than it had yet arrived at in Italy, and that if properly encouraged, Britain, instead of importing, will export the finest manufacture."

Long after the publication of the Hortus Gramineus Woburnensis, George Sinclair appeared again successfully before the public, as the editor of a fragment of a work on the "Weeds of Agriculture," by the late Mr Benjamin Holdich, published for "the benefit of the author's widow and family." In the preface to this little work, which has gone through several editions, Sinclair sketches the life of Holdich with much taste and good feeling. He was, it seems, the son of a farmer at Thorney, in the Isle of Ely, was self-educated, farmed under the Duke of Bedford, in his native parish,—leaving this farm, he became editor of the Old Farmer's Journal, which situation he held, I believe, until his death in 1824, when he was in his 58th year.

Sinclair felt, and acknowledged in his preface to this work, that the term weed was only a relative term, "for to have enumerated all the plants which, in one department or other of the art, fall under the head of weed, would have required a list of the principal part of the whole British Flora."

He divides the work into four divisions, which, like the Hortus Gramineus Woburnensis, are illustrated by coloured etchings. These include, 1. The weeds which infest samples of corn. 2. Rooted or fallow weeds. 3. Those which are principally objectionable from encumbering the soil. 4. The underling weeds, such as never rise with the crop, nor come into the sickle. It includes, in fact, all that can be said of most of the weeds which infest the arable soils of our island, and that in plain unadorned language.

The industry of Sinclair was exerted on all occasions, where knowledge was likely to be obtained, or the interest of the farmer promoted. When the salt-duties were repealed about the year 1820, he instituted a series of experiments to ascertain the value of this fertilizer, both in its simple state, and also when combined with other manures,. The results of these were included in his Prize Essay, and only one portion of the mass of experiments, the results of which he reduced to the tabular form, will convince the farmer of the laborious nature of his experiments. The soil on which the following experiments were made was sandy, and the plots each contained thirty-six square feet. The Talavera wheat was drilled into the soil November 5, and reaped August 2.—*Essay on Salt*, p. 40.

KIND OF MANURE AND MODE OF APPLYING IT.	Manures, omitting Fractions. Quantity per Acre.				Produce.	
	Dung in Tons.	Salt in Bus.	Lime in Bus.	Oil Cakein Bus.	Bus.	Wgt. of a Bus.
						lbs.
Spit manure applied previous to sowing the seed	45	...	...	...	4	57¾
Salt and spit manure dug in salt mixed with seed	45	44	...	...	75	58
Salt mixed with soil four inches deep before sowing	...	44	...	...	91	59
Salt ditto ditto ditto	...	5½	...	...	77	59
Salt sown with seed	...	5½	...	...	73	57
Salt combined with manure, dug in four inches deep	45	5½	...	...	75	52½
Salt and manure: salt sown with seed, manure dug in	45	5½	...	...	95	59
Salt and manure: salt applied to the surface	45	5½	...	...	82	57½
Salt simply applied to surface	...	5½	...	...	60	55
Salt and manure: salt applied to the surface	45	44	...	...	55	53¾
Salt simply applied to the surface	...	44	...	...	77	56
Salt and lime mixed, and applied with the seed	...	5½	121	...	66	56½
Salt and lime mixed, and applied before sowing	...	5½	120	...	68	56¼
Salt and lime mixed, and applied on the surface	...	5½	120	...	64	56
Lime applied with the seed	...	...	120	...	53	52½
Lime applied to the surface	...	...	120	...	57	54½
Salt, lime, and dung mixed, and applied as manure	90	5½	120	...	62	56½
Long dung dug in as manure	41	...	...	...	71	56¾
Salt and long dung mixed, and applied as manure	41	22	...	...	71	56
Lime and long dung mixed, and applied as manure	41	...	120	...	54	57
Salt and long dung mixed, and applied as manure	41	44	...	...	...	56
Oil-cake mixed, and applied with the seed	...	...	...	5½	48	56
Oil-cake applied as common manure	...	...	...	5½	73	60
Oil-cake and lime applied as common manure	...	...	120	5½	74¼	56¾
Salt and oil-cake mixed, and sown with the seed	...	5½	...	5½	60¼	52
Salt and oil-cake mixed, and applied as manure	...	5½	...	5½	74½	58
Salt, oil-cake, and manure, applied as manure	90	5½	...	5½	74½	58
Salt, oil-cake, and manure: the salt and oil-cake sown with the seed, manure previously dug in	90	5½	120	5½	55½	55½
Salt, oil-cake, and lime, applied as manure	...	5½	120	5½	71	51¼
Salt, oil cake, and lime, sown with the seed	...	5½	120	5½	55¼	55¼
Salt, oil-cake, and lime, applied to the surface	...	5½	...	5½	66	58
Salt applied to the soil in preceding spring	...	62	...	...	44¼	57½
Salt applied to the soil in preceding spring	...	31	...	...	26½	47½

Many of George Sinclair's papers are dispersed through the agricultural periodicals of his day,—all bearing the same character, as his separately published work, being full of valuable matter, experiments, and observations, described with all that simplicity, which gave such a value to all that he wrote. There is in vol. x., p. 31, of the *Transactions of the Highland and Agricultural Society*, a Prize Essay of his, "Upon the Grasses and other Plants best suited for Pasture during Winter." He divides this valuable paper in the following order:—1. The grasses and other herbaceous plants, which afford the most food in winter, and the situation and soils in which they are found most abundant, in a natural state. 2. The best mode of introducing these plants into pasture, where they are deficient in the due proportion, which experience has proved to be essential to permanency, and the highest rate of produce, the soil is capable of affording. 3. The mode of management best adapted to produce the largest supply of herbage during the winter. 4. The advantages, and disadvantages, of sowing grass-land, previous to winter, for the purpose of producing a rougher pasture during that season. He treats these important questions with his usual industry. He evidently inclined to prefer the introduction of grass seeds into pastures, combined with a top-dressing of well prepared farm compost. "The seeds are best mixed with the compost," he observes, "by passing both at the same time through a wire-screen, such as is used in gravel-pits, or a coarse wire-sieve. The quantity of compost ought not to be less than 10 cubic yards per acre. The quantity of seeds used will vary according to circumstances. It may assist, however, as a general rule in deciding on the quantity and proportions of the seeds that may be required, to state the full quantity requisite, and which would be required to make a new and ample pasture (equal in closeness of the texture of the turf to that of an ancient meadow) on a naked or fallow field, omitting of course the dwarf or *sole* grasses, excluded from the present inquiry."

Dactylis glomerata. Cocksfoot, ...	4	pecks.
Festuca pratensis. Meadow Fescue, . . .	3	...
Festuca elatior fertilis. Tall fertile meadow-grass, only in very heavy soils, constantly depastured with cattle, ...	0¾	...
Holcus avenaceus. Tall oat-grass, . . .	2	...
Agrostis stolonifera. Fiorin, ...	1	...
Holcus lanatus. Woolly soft grass, only in cases of considerable elevation, and poverty of soil, .		...

Lolium perenne. Pacey's perennial rye-grass, .	3 pecks.
Poterium sanguisorba. Burnet, ...	2 ...
Trifolium pratense perenne. Low grass, or perennial red clover, ...	6 lbs.
Trifolium repens. White clover, ...	8 ...

The growth of pasture herbage, to any valuable extent, is confined, Sinclair remarks, to seven months in favourable situations, and in the more elevated, exposed, and northern pastures, to a more limited space of time; and he observed, as a general rule, what many practical farmers will confirm, that, when the average daily temperature of the week has not materially exceeded 46° Farenheit, in such case the growth of pasture herbage is to all practical utility stationary. He found too, that, when the herbage that is produced under a low temperature, and at a season when the influence of the sun is weakest, was chemically examined, the saccharine and mucilaginous matters, particularly the former, are scarcely one-third so much as in the herbage produced in a higher temperature, when the influence of the sun is nearly at its highest degree, and the extractive bitter and saline matters are proportionally greater. In perfect herbage (leaves, culms, seed, and flower-stalks) which have been left uncropped until winter, when a considerable portion of it has become withered, or naturally made hay, the proportional differences in the quantities of the nutritive vegetable principles before mentioned vary but little, chiefly on a diminution of sugar, from what is afforded by the same species of herbage made into hay, in the best manner, and in the proper season; but one very important difference is found, in the much smaller quantity of all these principles, in the aggregate weight for weight which is afforded, by the partially dried winter forage. We have found it to vary from one-fourth to one-third: Thus 10.240 parts of well made hay, consisting of sweet vernal grass, cock's-foot, meadow foxtail, common meadow-grass, crested dog's-tail, hard fescue, soft brome, grass, woolly soft grass, perennial rye-grass, and perennial red clover, afforded 1.139 of saccharine, mucilaginous, bitter extractive, and saline matters, while an equal weight of the same grasses which had been saved on the ground until the first week in November, gave only .760 parts, being a loss of about one-third of the value. From these, and similar facts, it is evident, that, to obtain the largest quantity of winter forage on the land, we must look to that which is produced in summer, and not to late autumn or winter growth. The means which nature employs to provide a stock of winter forage, is by the more luxuriant tufts of herbage, produced throughout the season, by the dung dropped by the stock, and which are neglected by the same stock until winter.

In the first volume of this Journal, p. 65, he gave a list of various agricultural seeds. In vol. iii., p. 976, a paper on the conversion of clay land into permanent pasture ; and at p. 45 of vol. v., another article on the conversion of strong loam into permanent pasture.

In taking our leave of the writings which are the subject of this paper, works not nearly so generally read as their merits deserve, we cannot but feel, that their author must be classed amongst the great modern benefactors of agriculture. The laborious nature of his experiments, the care and unceasing attention which they for a lengthened period required, would have exhausted the patience of any man less energetic, and less persevering in his habits, than George Sinclair. He was ever labouring to collect new facts and observations. In none of his published works, however, has he any claims to either elegance of style or closeness of reasoning,—his composition is always neat, but never very attractive ; he was often too solicitous to relate minute details. His collection of valuable observations and experiments, however, is immense,—and thus constituted, the Hortus Gramineus Woburnensis, must long remain a text-book for the English farmer, on every subject relating to the indigenous grasses of our island. He will ever, therefore, be entitled to the cultivators' grateful remembrance, many of whom are in fact now reaping the benefit of his exertions, who are ignorant of even the fact that such a benefactor to agriculture ever existed. Sinclair laboured indeed for no mean object ; his attempts, which to a considerable extent were crowned with success, were chiefly directed to increase the means of support, for a more numerous live stock, than had hitherto been able to tenant the poorer soils of our country ; and this being accomplished, led as a natural consequence, to the generally increased fertility of such lands. These great objects he, in general, successfully attained, not by chance-directed experiments and discoveries, but by seeking for and examining the grasses, which are the native occupants of the soil,—by following, in fact, as our great Bacon long since advised, the order of Nature, watching her steps, and being guided by her instructions. And by following this course, for a lengthened period, he finally collected the mass of valuable materials, upon the grasses, which will continue to be the study of the accomplished farmer, as long as "science, with practice," shall remain the motto of the best and most prosperous tillers of the earth.

MODERN IMPROVEMENTS.

By Mr Main, Chelsea.

It is commonly said, that, for social and mental amusement, "a good tale cannot be too often told;" so it is as respects agriculture, or, indeed, any other culture, that a good practice cannot be too often reported or reiterated. The great and manifest advances which have of late years been made both in the knowledge and practice of farming, scarcely leaves room for a new suggestion on the subject. But it is remarkable that those advances have not been universally diffused. They seem to have been confined to certain classes of men, and to certain districts of the country; and this, I apprehend, is chiefly attributable to the nature of the land which gave facilities for the exercise of both thought and action in working out improvements, whether scientific or practical.

In my early days I had the happiness of being slightly acquainted, and that acquaintance but for a short time, with a most respectable body of agriculturists—the Dudgeons, Hunters, Shirreffs, Howdens, &c. on the estate of Tyninghame in East Lothian. They were all farmers of the first rank, and all individually, as well as collectively, as well versed in the science of the business as any of the most accomplished farmers of the present day. Since that time, that is, above fifty years ago, I have seen the best practices, and have read the greater part of all that has been published (a mighty mass of matter!) on the business, and yet I can say with great truth, that I have hardly met with a new scientific fact but what I gained some idea of, or heard discussed in the conversations of the gentlemen above alluded to; not even excepting those particulars which I intend to make the leading topic of this communication.

That "there is nothing new under the sun," is another old adage, and even this may be applied in some sort to the practice of agriculture. For one or two of our most modern improvements are not new inventions, but very old ones more generally adopted and prosecuted. I particularly allude to furrow or thorough-draining, and subsoil-ploughing; the latter certainly the newest custom. But even this, though not so named or similarly executed, was practised in principle, though not in manner, on the estate before mentioned. There were some fine alluvial fields on the banks of the river Tyne, both meadow and arable, and it had been the custom in working the latter, to plough deeper and deeper for every succeeding crop, in order to bring up a slice of the unexhausted subsoil, and with the very best effect on that peculiarly rich tract. This, though only practicable on deep alluvial soils, may be much more generally and beneficially practised everywhere, as Mr Smith's ploughs and performances have so decidedly shewn, than has been customary heretofore, or as exists very generally at present. For what is it but transferring the action of the spade in gardens to that of the plough on fields? Our subsoils have been too much neglected or misunderstood; nay, more, have even frightened the cultivator from having any thing to do with them. Some farmers of my acquaintance would as soon break their own arms as think of breaking *the pan* of their arable land!—that pan on which the plough is borne over with so much ease for both ploughman and horses; for whether gravel or obdurate clay, it must not be disturbed lest some serious misfortune should happen.

Mr Smith's excellent invention will serve to banish those old-fashioned fears; and though its chief purpose is to give full effect to thorough-draining of clayey soils, yet its deepening effect on every description of soil, whether wet or dry, will eventually be of incalculable advantage to all arable land.

We have heard much of the powers and discoveries of chemistry lately, but we need not go to that science to be informed that deepening the staple and intermixing the strata of earths of which it is composed, as much as we can, is particularly beneficial to plants; as the disruption or pulverization of the soil admits the access of all atmospheric influences, whence are derived so much of the organisable food of vegetation; and therefore the subsoil and rack-heath ploughs may be considered as the most important appliances which have been received by the practical farmer since the invention of the thrashing-mill on the Tyninghame estate.

Disturbing the subsoil has another good effect, not often thought of, namely, it allows the ascent of warm vapour which is ever rising from the interior of the earth. This salubrious phenomenon is ever in action, though only visible in frosty weather, while rising from pits or other excavations in the earth. A loose surface is kept moist by this vapour when drought prevails; but a dense or compact surface or subsoil checks the ascent of the aqueous part of the vapour, while the heat of it escapes. All disturbance, therefore, as already observed, of either the upper or under strata of the arable staple is immediately, as well as ultimately, beneficial to all crops, and not only for the advantage above alluded to, but for the greater scope it allows to the roots to extend themselves.

We cannot say but that these facts have been long known to cultivators; but assuredly many of them have slept over this precious portion of agricultural knowledge, and so soundly, that they have required the genius and perseverance of a Smith to arouse them into action. And as the present prospects of farmers are not the most cheering, seeing that every wheat-bearing acre in the north of Europe, as well as in America, will be brought into competition with the acres of Britain, it behoves the British cultivator to look about him, and to avail himself of every expedient of culture by which he may be able to increase his products.

Mr Smith's plan of first loosening the pan or subsoil, and which may be gradually afterwards incorporated with the surface, is an excellent measure or means of improving the staple; for it is well known that there is a certain quality in all maiden soils, that is, those which have not been exhausted by previous cropping, which is particularly exciting and nutritious to all sorts of terrestrial plants. Chalk, limestone, clay, gravel, sand, or loam of any kind dug from pits, laid upon any arable surface, or even that of meadow, will add a fresh vigour to the plants growing, or seeds sown thereon. It is for this reason that soils of different consistence and qualities are recommended to be intermixed, not only for the purpose of altering their constitutional properties, but for adding to their fertility. But in carting sand to be incorporated with clays, or clay or marl upon sand, a heavy expense is incurred; and therefore if a subsoil can be brought up by merely ploughing a little deeper by a stronger team, the expense is comparatively trifling, while the improvement is both salutary and permanent.

I knew an eminent nurseryman who trenched his ground for every new crop of trees he had occasion to bed or row out. And when it was hinted to him that such expensive labour was unnecessary, the same quadrangle having been trenched only two years before, he answered, "That does not signify, because I know," said he, "from long experience, that the oftener ground is turned over trenching-depth, the better it is for the plants to be grown upon it." So that every approach that can be made towards that nurseryman's principle in the fields must be advantageous; and Mr Smith's new implement promises to be the best of the kind for the general purposes of the farmer; for while it does not bury what is considered the most ameliorated part of the soil, it brings gradually into use that part which lies inactive below, and perhaps acts injuriously as an impervious bed to both air and water. Trenching-ploughs of enormous weight and strength have been long in use for turning over land where coppice-woods have been destroyed, or for breaking up wastes intended to be planted. These require a power of four or five pairs of horses, and are altogether too unwieldy and useless compared with the subsoil-plough.

Some farmers, and particularly in the county of Norfolk, undervalue the use of the subsoil-plough, merely because in many places in that county they have no land-springs; and therefore think that that plough can only be useful on wet land. On this point I presume to think the Norfolk farmers are mistaken, and have, in a preceding part of this article, given my reasons for my belief, that breaking into the subsoil, whether wet or dry, is beneficial not only to the crops, but to the farmer. Indeed, I consider the invention of the subsoil-plough one of the happiest auxiliaries of which a farmer can avail himself as a renovator of his old worn-out acres.

Next in importance to this renovation of the staple of arable land, I would suggest a more frequent change of seed, and a more lengthened rotation of crops. These things, I am fully aware, have been suggested and pointed out a hundred times before. Still a change of seed is not admitted into the system of farming so generally as it should be. For however remarkable it may be, a foreign or strange seed will develope itself with greater strength than any home-grown seed of the same kind will do; and it really seems that the stranger finds either a new kind of food, or a fresher and more salubrious kind of air than it would have in its native place. In every description of new broken upland, or such as has not previously borne any kind of cultivated crop, there exists some peculiar property or quality eminently exciting and salubrious to vegetation. Hence the luxuriant first crops raised on the newly cultivated lands in our recently peopled colonies; and by the new squatters in the wilds of America. And so much is this found to be the case, that these settlers will prefer to clear a new station rather than continue to cultivate the old already cleared spot. Hence it is that newly reclaimed land from our ancient wastes and commons in this country are so exceedingly fertile for a few years after the enclosure; and the same success follows the application of any fresh earth upon an exhausted field, whether carted from a distance, or raised from the subsoil by a deeper stirring plough.

Whatever this peculiar quality of maiden earth may be, and whether or not known to chemists, has not been as yet revealed to us; and if it were, it would be probably described as some gaseous body, neither tangible nor appreciable by the cultivator, except in so far as it is certainly present in all unexhausted earth. But it is not either possible or necessary that all plants should always have maiden earth, so as a judicious rotation of cropping be followed. For as each species, or even variety of a species, seems to require a peculiar food, or a peculiar excitement from the medium in which it is placed, a frequent change of seed, and of the different varieties of the same kinds, is the easiest and most eligible plan of proceeding, in order to draw forth the latent powers of the soil. I remember a striking instance, among many others, which fell under my own observation. On a neighbouring farm there was a field of about twelve acres, which, in the remembrance of man, had never borne a crop of barley. It being of a clayey nature, the grandfather, father, as well as the present tenant, never deemed it fit for barley. Its usual round of crops were a dunged fallow for either wheat or turnips,—these last followed by oats and seeds, and after the clover, again with wheat. This was the long-continued rotation, except after the fallow-wheat, beans or peas were sometimes introduced. The tenant was at last induced to venture a crop of barley, after a pretty fair crop of turnips had been folded off. The field was got into a good tilth by repeated ploughing, harrowing, and rolling, and barley for the first time sown. The crop was prodigious! and the wonder of all the farmers around. This result was certainly owing to the soil being new to the barley, and the barley new to the soil; the latter not being exhausted of the peculiar food of that grain. So it happens with new varieties of any kind of field crops; they usually turn out better for a few years after their introduction to any farm than they prove after they have been for some years accustomed to the new station; therefore, a frequent change of seed is one of the best customs a farmer can have recourse to; and if from the most distant quarter, so much the better, provided it has not been kiln-dried, and is free from bad weeds.

These three particulars,—namely, draining, subsoil-ploughing, and a frequent change of seed,—I consider to be the only measures by which the present state of farming, and that of farmers themselves, can be improved. Should the foreign rivalry with which they are now threatened take place to any great extent, they must devise some means of using all their inferior grain at home as food for sheep, oxen, &c., as a more profitable plan than carrying it to market to sell at a continental price. It is not likely, however, that the British farmer will, for some years at least, be driven from his own markets either by the quantity or qualities (except some of the high dried Dantzic wheat) of corn imported from the north of Europe; but what is more to be dreaded as the natural consequence of opening the British ports to corn from the Baltic, will be to bring all those countries into extensive cultivation for producing wheat entirely for the British market, and thereby render the growth of that grain in this country of much less consequence to the farmer. It is not to be supposed, indeed, that many of the continental landlords or barons have either the means or inclination to bring their thousands of acres of waste land into wheat culture, save what can be accomplished by their degraded boors. But if such extensive improvements be practicable, capital would not be long wanting, provided a constantly open ready-money market demanded the produce.

Our countrymen in Canada must be allowed access to our markets; and the United States Americans, cannot well be shut out, merely because they require repayment not in money, but in our manufactured goods. Care must be taken, however, that the transit of American flour does not come to us through Canada.

These are matters which have agitated the public mind, and it is not easy to see how the antagonist ideas are to be reconciled. It would be well if international affairs could be so ordered that foreigners should advance to us, rather than that we should descend to them. But as there is an equalizing principle always in operation, it is to be hoped that, from the elastic nature of the British constitution, and from the natural energy and enterprize of the British people, the present difficulties will be surmounted, and all derangements settled down upon an equitable basis.

I might have added, among practicable improvements, that of saving the drainage from dunghills in tanks, and bestowing it on either grass or arable land from water-carts, as is so beneficially done on the Continent.

ON M. THAËR'S PRINCIPES RAISONNÉ'S D'AGRICULTURE.

The high reputation attached to the author of this publication as a scientific and practical agriculturist, independently of his other claims to consideration, as well as the intrinsic character of the work itself, render it incumbent on us to notice it.

The individual history of M. Thaër, as far as it is connected with husbandry, is as follows:—He acquired his early education and practice in the celebrated agricultural seminary at Moëglin, which his father had established in 1804, through the munificence of the late King of Prussia.* Subsequently he passed nine years in effecting agricultural improvements in Russia, where he obtained a character for great general ability, and peculiar success in the management of sheep. On the death of his father, he became the owner and superintendent of the farm at Moëglin, and director of the celebrated academy, which the familiarity of the subject, and the limits of our space, prohibit us from noticing any farther. A man thus educated and experienced is pre-eminently qualified to write a book in which the abstract principles and practical details of his favourite art are combined, and the result of his labour and talents in this respect is fully answerable to the expectations we had formed of the publication.

We shall now advert to the work itself, premising, that we have only read the French translation of it, by the Baron G. V. Crud, in whose hands—judging from the elegance and perspicuity with which he has written—it has not lost any of its original excellence. But a word or two with regard to the responsibilities of this gentleman in his capacity of translator. In his first preface he states, in substance, that the author had given him authority to make any abridgments or other alterations he might think fit, but that he found the subjects so involved in each other, and so mutually dependent, that he could not omit any parts without weakening the force or propriety of others, and loss to the reader.

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* His Majesty had previously presented him with a vast tract of reclaimed marsh on the banks of the Oder, which he afterwards allowed him to sell, for the express purpose of purchasing about 1300 acres at Moëglin, and establishing the seminary, in which he had the appointment of the professors. He had a pension also of L.600 a-year.

As to the form in which the thoughts of the author are conveyed, the Baron says that he has varied little from the original, and has not introduced any observations or modifications of his own into the text, but has given them in notes, wherever he has seen occasion to suggest alterations, from considerations of the differences in soil and climate, or from his own experience: nor has he multiplied his notes to a great extent,—a matter perhaps to be regretted, for those which he has furnished, though put forward in a very unpretending manner, are highly judicious. He has, however, taken the pains of reducing to those which the author himself uses in his calculations, all the land-measures and grain-weights and measures used throughout no fewer than one hundred and twenty-eight European states or provinces, in order that, by means of a common rule of comparison, the reader may accommodate his local measures, &c., to the standard furnished by M. Thaër in his estimates.

The work, besides an appendix or atlas of various tables and plates, consists of four large octavo volumes. The principal preface from the pen of the Baron, is prefixed to the second volume, which is the most scientific, comprehending the physiology of plants—the principles of agricultural chemistry, at considerable length (involving the wide range of manures)—geology and the analysis of soils. This volume, we think, ought to have been the first, as it is by far the most theorectical, and therefore a natural introduction to what is practical.

It would appear as if M. Thaër had written without a complete arrangement of his varied compositions, or that after his first notes and essays he had added new matter, and enlarged his original plan. On this supposition only can we reconcile a want of method and of *distinctness* in some of the parts. The want of an alphabetical index to assist the reader in tracing subjects through the different ramifications in which they are sometimes involved, is also to be desired, as a view of the very multifarious nature of the contents will shew. The whole work is divided into four sections. The first volume, after a short but pertinent preface, commences with "the idea of husbandry *discussed* in its principles,"[*]—but though this is the preliminary subject, and gives the title to an entire cyclopædia of agriculture, it is cut short after a few sentences. However, the bases of the *science*, and of the practice, are afterwards dwelt upon at length. All the introductory matter, usual in our standard works, on agriculture, is put forward—such as preliminary education in agricultural schools, or ordinary farm establishments,—capital,—leases,—selection of land,—arrangement and classification of fields, with respect to soil and condition,—enclosures,—garden, house, offices, &c. under their respective heads; these are comprized in the first section, which occupies one-fourth of the first volume. The second section goes into the economy of the farm, with excellent observations respecting labour; and the circumstances which regulate the payment of wages, in money or in kind; registries; live stock in all its varieties; the principles on which fattening ought to be conducted, with calculations as to the comparative nutritiveness of different vegetable substances; rotations, and alternate culture; and a variety of other matters under those heads.

Then, after all this, which most readers would suppose would be the termination of the whole, the second volume makes its appearance, with a long and able preface from the translator, which is in effect a digest of the principles of vegetation, and of agricultural chemistry. The second section is concluded at a very early part of this volume; and the third section commences under the head of *agronomy*, which, as the translator informs us, should be read with great attention, in order to extract its matter with full advantage to the reader. This section first treats of the component parts of soils, and the author goes deeply into this interesting subject, noticing at considerable length lime, chalk, marl, gypsum, the nature and effects of *humus*, and its different combinations with the elementary earths and atmospheric influences; and then succeeds a vast deal under the particular head of *agriculture* (first part), which, in our simplicity, we had imagined to have been essentially the subject on which we had been before engaged. This division comprehends first manures, animal, vegetable, and mineral, a sequence to the "constituent and physical properties of soils and the mode of judging of land," contained in the preceding division—agronomy—but designed principally to explain the *modus operandi* of manuring substances; with a great deal which seems in some respects a repetition of points previously discussed under the head of agronomy, and which might better have been included in it. But it is remarkable that he scarcely notices *calcareous sands;* he merely says, "there are many kinds of sand which are not composed of silex alone, and which contain grains of lime (if this has not been separated by washing); calcareous sand is not insoluble like siliceous sand, and is much more favourable to vegetation. However, we have not had sufficient opportunities of observation on this subject." We know the nature and effects of such sand, and how highly calcareous it is on some parts of our coasts—containing, if we mistake not, 75 or more per cent. of lime; for instance, in Bantry Bay.

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[*] *Principes raisonnés, reasoned* or argued on its principles.

But we have never seen any analysis of sand so complete as that with which we have been favoured by M. Clauss, a French gentleman remarkable for his chemical pursuits. The analysis which he has lately made of the *tangue* or sand in the bay of St Michael, on the west coast of Normandy, and in the rivers which flow into it, shew how various are the elements which may be contained in an apparently simple substance. M. Clauss has found, in a 1000 parts of this sand (which is very fine, but not impalpable to the touch), the following substances:—

1. Organic matter, lightly azoted,	12.27
2. Chlorine,	4.45
3. Sulphuric acid,	13.53
4. Carbonic acid,	155.
5. Phosphoric acid,	7.35
6. Sodium,	3.76
7. Soda (oxide of sodium),	8.83
8. Potassium,	0.18
9. Potass (oxide of potassium),	29.12
10. Magnesium,	0.37

11.	Magnesia (oxide of magnesium),	13.94
12.	Lime,	204.43
13.	Iron,	4.70
14.	Oxide of iron,	23.91
15.	Peroxide of manganese,	7.34
16.	Lead,	2.84
17.	Sulphur,	4.79
18.	Silex,	413.23
19.	Alumina,	72.95
20.	Oxide of manganese,	0.02
	Loss,	15.99
		1000.

But to revert to our analysis of the work itself.—The second division of "agriculture" successively treats of culture,—implements of husbandry, with their respective advantages or disadvantages,—clearing land from trees and all other incumbrances,—establishing a vegetable soil on sand,—hedges and other fences,—drāining,—irrigation,—treatment of meadow and pasture lands,—haymaking.

The fourth volume commences with the 5th section, and comprises the reproduction of vegetable and animal substances, varieties of cereal crops, cheesemaking, corn-crops, in drills,—harvesting, leguminous plants, oleaginous plants (including hemp and flax),—plants for dyeing,—potatoes and other roots for the support of man and beast, and artificial or cultivated grasses. The 6th and concluding section enters into the whole economy of live stock, with dairy management, the treatment of milch-cows,—fattening cattle,—the treatment of swine,—sheep,—and lastly, of the noblest of all domestic animals,—the horse.

Such is the general plan of this really great work, which seems to be based on the model of Sir John Sinclair's Code of Agriculture, and incorporates in its construction much of what is to be found in our own standard works, and yet with much originality in the recombinations. Being so multifarious in its nature, it is no easy matter to select portions as fair specimens of the style and manner in which the whole has been executed, nor is there any thing positively new to our first-rate agriculturists, excepting, of course, the culture of a few crops, unsuited to our climate, and practically unknown to our husbandmen; but the keen observations of this reflecting writer on many subjects are of a highly instructive and interesting character. It is due to M. Thaër to say, that he is an original *thinker*, a scientific and practical scholar, and a very clever writer.

The circulation of the translated copy in France, where husbandry is so defective, may do much good by stimulating and informing the higher and well educated class of land-owners, but the great body of proprietors there will neither incur the expense of purchasing the work, nor take the trouble of reading it if they obtain access to it. The towns, for the social pleasures which they yield, are the places of resort and residence of both great and small proprietors of the gentry class, who prefer living on their rents, be the amount but L.100, or even L.50 a-year, in a town house or lodging, to residence in the country and the improvement of their properties; and nothing is more likely to serve the interests of the great as well as those of the vast number of petty proprietors, or to improve the class of labourers than the introduction among them of a system of culture, which, within thirty years, has effected in the north of Germany an improved condition, that nothing but personal observation can fully appreciate. An abridgment and re-arrangement of some of the subjects of the work would be desirable for the French farmers, to whom it offers, in the opinion of Baron de Crud, "a great number of new ideas and useful directions, by connecting art with science, and introducing the theory of agriculture into the departments of natural history in general, and of chemistry in particular." Some notion of the energy with which the husbandry of the north of Germany is pursued, may be collected from the fact, that *many hundreds* of the most distinguished agriculturists in that country have been assembled for the purpose of discussing questions affecting husbandry, each branch having its own committee, president, and secretary, and all converging to the common centre; and the King of Prussia, on such occasions, himself entertaining at his palace the most distinguished representatives of different countries.

In short, a most extraordinary impulse has been given in that country to its agriculture, and nothing has been omitted by the Government to advance it. The British system has been an especial object of consideration, and every thing excellent in our practice is well understood there. Nor is it a little remarkable that the models of rural economy have been first found among the smallest land occupiers, the class known by the term small-holders in Ireland, on whose small allotments the utmost productiveness and the neatest culture had been attained long before the skill and representations of M. Thaër, and individuals like him, prevailed upon the *great* land-owners and the capitalists, to expend time and money in relaiming their comparative wastes, and subjecting them to the draining-spade, the grubber, and the plough.

We shall now proceed to lay before the reader some selections from the work under consideration, as illustrative of the style and matter. Under the head of leases and covenants, the author thus observes,—

"The proprietor should always direct his attention to obtain from his land a gradual increase of produce, or to augment its value continually. The farmer only desires the greatest profit during the continuance of his lease, without caring for the value of the land afterwards. Whilst the proprietor can content himself with a trifling produce during a few years, in order to attain greater and more durable profit subsequently, the tenant must, on the contrary, endeavour to obtain the greatest produce, even though its amount should be diminished during the latter years of his lease; because the proprietor who wishes to farm on the best system, finds at the same time both pleasure and profit in laying out on his property as much capital as he can spare, whilst the tenant, on the contrary, withdraws as much of his pecuniary resources as possible, to employ it in other ways, or to place it at interest. The improvement of the land constitutes the pleasure of the proprietor, while the mere occupying farmer only thinks of augmenting his income. Thus the longer the lease may be, the more do the interests of the landlord and tenant become identified; the shorter the term, the more conflicting are those interests. With a lease of 24 years, a tenant ought, at least during the first two-thirds of its duration, to follow out the views of the proprietor. But the time will come when he will act on different principles, and endeavour to extract from the land a return in proportion to his outlay at the commencement.

"To this must be added, that a tenant cannot have the means of laying out so much on the land as the proprietor, even if he wished to do so. The latter must pay the rent, whilst a proprietor anxious to improve can economize something from the net produce to expend on his property.

The first may be compared to a merchant who trades on borrowed money; the second to one who speculates with his own funds. The former must first provide for his rent, the latter need only think of extending his speculations."

No one indeed anywhere ought to expect that a tenant will expend his capital, or sacrifice any of his certain profits, on real or speculative improvements, from which he is not to derive ultimate benefit; and British landlords who understand their own interest (while they are also influenced by principles of equity, and disposed to promote the welfare of their tenants), do usually expend the necessary capital in effecting those permanent improvements which the tenant will not undertake without something more than mere expectation that his term of tenure will be renewed. There are farmers, no doubt, but they are few, and cannot be deemed prudent ones, so enthusiastically devoted to their profession, as to discard prudential considerations for the gratification which they experience in farming in the most perfect way as to system, and who would no more deviate from the exact routine of superior practice for the sake of avoiding pecuniary risk or loss, than an artist of nice taste would give from his hands an imperfect piece of workmanship, for the sake of the time or the materials he might save by doing so. But such farmers, except in the *amateur* class, are only stray cases from a general rule.

The confidence which exists between our great proprietors and their tenantry, is similar to that which prevails in some of the German States between the Government and its tenants. Where the tenant faithfully pursues the system prescribed by the administration of the country and improves, he is always, in Prussia, certain that his lease will be renewed at its termination on perfectly just principles, and the tenure thus practically becomes perpetual in the family. If a British landlord, necessitous or griping, should have no consideration for a correct and honest tenant, and let the farm over his head to the highest bidder, he must expect that his property under such an infamous system will deteriorate in value and condition.

It appears that the Irish method, so often illustrated, of doing the greatest possible amount of injury to the soil, is not unknown in Germany, as the following humorous detail of instructions will shew. M. Thaër, however, does not assume the merit of its authorship, nor does it harmonize with the prevailing gravity and logical preciseness of his style.

"1. Procure a farm in high condition. You can afford to pay for it during a short term a rent double what you could give for one which had been impoverished by an avaricious and exacting farmer, as you can exercise to the utmost upon land in full heart the greatest refinement in the art of exhausting, whereas on a farm of the opposite description you would be obliged to follow the ordinary routine.

"2. Never cultivate any crop except grain for sale, wherever it is possible to do so; sow nothing whatever for cattle, because they do not immediately repay improved keeping, and during a short lease you would not have time to extract all the substance of the manure which you might employ.

"3. Between the fallows, cultivate what gives the greatest produce, such as oleaginous plants, flax, tobacco, &c., and if you cannot grow them yourself, let out the land to some poor people in your neighbourhood, for cash or part of the produce. It is of little consequence that those crops do not yield straw, as the farmer is often prohibited from selling it, and therefore you could not venture to do so openly, or in large quantities.

"4. As these crops require a great deal of manure, of which you will have less every year, you should raise them in the fields which are in the best condition, and nearest, that the cartage may not occupy too much time. Even supposing that, during the latter years of your lease, the other fields should not make any return at all, you will have been sufficiently indemnified, and you will then have a right to complain of the sterility of the land, and to demand a reduction. Besides, the nearest land will appear better to the proprietor and to strangers, and if any one should say that flax, rape, and tobacco, exhaust the soil, you need only draw their attention to the fine wheat which grows beside them. Never put dung on the fields which require it most, for a poor field does not pay the first manuring; at all events, you need only put a little on head riggs or near the roads.

"5. During the first years of your lease, give the ground the most complete working to banish weeds, in order that you may obtain all the benefit that the manuring principles in the soil can produce, and pulverize the clods so completely, that the roots of the plants may draw full nourishment from them. For this purpose increase your teams, for which you will be well indemnified afterwards. But towards the end of your term you must discontinue this good tillage, that you may be able to diminish your teams, or employ them in a more advantageous manner. Use also a very wide ploughshare, that will take furrow slices of, at least, twelve inches each. It is not necessary, in the last year, that you should be very particular in availing yourself of the most favourable times for sowing the crops which you will not reap; choose, therefore, the most convenient season for such purpose.

"6. It is a great advantage to have old grass lands to break up, or timber to cut down; and you ought to endeavour to obtain these advantages accordingly, when looking for a farm. Land thus brought into cultivation, will give you at first fine corn crops to sell; and afterwards they will produce sufficiently well, without manure, until the expiration of your term. It does not signify to you whether they are then completely exhausted or not.

"7. Take no trouble with the meadows, except in mowing them closely, as they do not quickly repay improvements, and if, in the last years of your lease, the filling up of drains and ditches, or the overflowing of water has rendered them marshy, covered with briars, bushes, and molehills, and if they only yield little and bad hay, this is of little consequence to you, if you are not allowed to sell the hay.

"8. If, having received the farm stock and implements at a fixed rate, you are bound to give them up again, get rid of the best horses, oxen, cows, &c. and put bad ones in their places, or else pay for what are deficient. In changes of this nature, the good are always valued lower, in proportion, than the bad, and these last appear less miserable when they are not by the side of good ones. In the concluding period of your lease, it is unwise to let the cows have access to the bull, until very late in the season, in order that, when you are giving them up, they may look full; and when in calf they will of course have the appearance which you wish, even if they have been kept on bad and insufficient fodder. Have all old harness and implements entered carefully in the list of things for which you must account; keep, for the purpose of replacing them, every thing which can no longer be used, and have them patched up. As to the new articles, put them aside. A shabby stock of this kind inspire the valuators with pity for the farmer, and induces them to treat him favourably.

"9. It is clear that you should not spend any thing on keeping up gardens, ponds, and buildings; for, generally the proprietor, on renewing the lease, undertakes to repair them; for which reason it is better for you to allow small damages to increase.

"10. You will exact from the cottiers or hinds, who are bound to give duty service, all that the law and custom permit. It is no affair of yours if they are ruined.

"11. If the proprietor reserves any of the farm produce for himself, or puts a high price on your produce because it comes from his own land, and that he makes you thus a considerable reduction, be sure not to refuse it. If he is very precise in his demands, you must make friends of his *servants* who are to receive the commodities for him."

Supposing the Irish tenant to act in violation of all stringent regulations, his purse is often so empty, that there is no use in suing him at law for the infraction of them; and therefore the proverb, "Sue a beggar," &c. becomes applicable to the case; or the landlord is so happy to get rid of his unimproving and profitless tenant, on any terms, that he is not very particular in the enforcement of conditions, which, under a better system, might be critically fulfilled.

In estimating the different modes of conducting farm labour—by domestic servants, workmen, with families supported like our hinds, and jobbers—M. Thaër expresses himself in favour of the first class, though he admits that the day-labourers require much less care and vigilance, and are more industrious and economical from their family obligations: the payment for this class is in kind, barley being the standard grain. Threshers are also paid in grain, receiving from $\frac{1}{14}$th to $\frac{1}{18}$th of the produce; and harvest labourers, in some localities, receive, by established custom, the eleventh or thirteenth sheaf for getting in the crop. In short, the system approved of by M. Thaër, and adopted in Prussia, is entirely analagous to our Scotch system, and the Irish practice where it is of the most considerate and effective kind.

"The number of these families ought to be estimated and fixed in proportion to the labour required and the system of culture pursued; they should be sufficient to execute all the indispensable operations of the farm, but not more numerous than is requisite for such purpose, else they will be occasions of extra expense; in fact, they should be so circumstanced as to have the means of earning provisions all the year round, and be able to put by something. In such case there will be no difficulty in providing a sufficiency of labouring families, especially if they have no deficiency of fuel. They ought to have a little garden for kitchen vegetables, or a small field, but not of such extent as to render it an object with them to employ their time on it, instead of working for their employers."

This last principle is critically that of the London Labourers' Friend Society, viz., that the allotment should be no more than will occupy the surplus hours of labour, or employ the workman's family occasionally, without interfering with his stipendiary work, or rendering him independent in any degree. We learn from M. Thaër, that in some localities there is an obligation on the small farmers and peasantry (as used to be the case in France until the First Revolution abolished this remnant of the feudal system, and more or less in Ireland and in our country), to render duty-service to the land proprietors. M. Thaër, of course, deprecates the practice, and urges, during its continuance, kindness and consideration towards the serfs, as the best means of stimulating to industry, and inducing a comparatively willing discharge of their services.

According to local customs, or the extent and nature of a tenant's holding, he is bound to supply teams with ploughs and harrows, or only to give his personal labour. The first class of those subject to the *Corvée*, as it is termed in the French version, are subdivided into two classes, one of which must furnish teams of four or more horses or oxen, the other but two or one.

The lowest order give duty-work, like the Irish cottar, for their house and field; but not like him, often at the caprice of the exacting middleman, under whom he barely exists—days, weeks, or seasons, being usually fixed for the purpose.

> "These duty-services are more injurious to him who is bound to discharge them, and to general interests, than any other kind of servitude, because they occasion idleness, apathy, ill-designs, and opposition; are injurious to morality, and occasion a loss of time and the means of effective labour. The workman—perhaps the son or domestic assistant of the peasant—is encouraged by his father or employer to execute as little of the duty-work as possible, and to deceive; he is led to consider it a point of honour to impose upon the proprietor when claiming his seignorial dues: and, in the end, he learns to impose upon his own master or father—and himself, in losing the power of working with energy. For these reasons, we find the labourers most idle in those districts where Corvées are established."

On the principal farms in northern Germany, besides the head bailiffs (as we collect from an official report of M. Nibiere to the French ministry), there are subordinates, called Second or Third *Werwalters*.

The German bailiff attains his qualifications and graduates in this way. At the age of sixteen or seventeen he goes to a great farmer, termed an *Economist*, who takes him for three years, and receives an annual payment for his maintenance. This youth is then put in charge, for the first year, of farm-yard offices, stables, lofts, granaries, &c.; the next year he takes his full part with the labourers in the common operations of the farm, and at this time, perhaps, he is allowed to go between the stilts of a plough; then, as he advances in practice and intelligence, he sows seeds, &c.; and the third year he keeps the farm accounts. At the end of this apprenticeship, he is hired for some other farm in the capacity of Second *Werwalter*, in which he usually continues for two years; after which—if circumstances do not lead him to enter one of the great agricultural institutions, to qualify him for the management of the land estates of a non-resident proprietor, a royal farm, or his own land, he easily procures by means of good testimonials, the situation of first *Werwalter*, with a salary of from L.24 to L.32 a-year.

Ye Scotch and English stewards and bailiffs, think of this amount of salary, and, at least, be content with your wages!

M. Thaër enters fully into the question whether horses or oxen be the more economical, and asserts, that no positive result has yet been obtained on the subject. He states the *pros* and the *cons* (with which every complete farmer is familiar), in the fairest way, and infers that horses should be kept at least in some measure on account of those labours. Harrowing, for instance, which requires a quick step, and also from their being able to withstand the heat of spring and summer, when oxen fail, or can only work during a portion of the day. This matter, of course, can only be decided by the circumstances of climate, soil, the construction of ploughs, and local considerations. The translator enters into the arithmetical calculations of prime cost, food, wear and tear, &c., and the number of days' work which each description of animal averages in the year.

On the subject of fallows, the author is also diffuse and interesting; his reasonings are clear, and his deductions generally just; he inclines even under the most improved system of rotations to a complete fallow at intervals,—here we differ from him in principle altogether.

His preliminary explanations of fallow are concise, and may be new to those of our readers who are unfortunately for themselves unacquainted with the Latin language and the practice of husbandry as conducted by the Romans when Virgil wrote his Georgics, and Columella published his treatises:—"The subject of fallowing has been much obscured from want of precision as to the phrase; originally, a fallow meant that condition of the land in which, during a summer, or, still better, an entire year, it was stirred, broken down, and so pulverized, as to be prepared in the best possible way for the succeeding crops.

"The Roman writers had taught this practice, prescribed it as indispensable in certain circumstances, and given names to each of the operations of which it consisted; thus they expressed the action which we call reducing or breaking, by the word *fringere,* the second stirring by *vertere,* the third by *infringere,* the fourth by *revertere,* the fifth by *refringere,* the sixth or final preparation for the seed sowing, by *lirare.*

"But the word fallow has been taken in an entirely different sense. According as, by negligence, the result of a bad system or want of pasturage, and against the very object of fallowing the land, has not been broken until June or even August, and yet said to be in fallow, and thus, by applying the term to a field in a state of repose, much misconception has entered into the discussion of the subject. We ought to restore to the word its proper and original meaning—to fallow, is to prepare the land for the succeeding crop by repeated operations performed during the summer, without drawing any produce from it during a year."

He gives his reasons for the preference of an entire fallow, which are so well expressed, that we shall not omit them:—

"Yet they (if sown with summer fallow crops), never produce the full effects of a bare fallow. * * * It is also known that ordinary tillage is not sufficient for leguminous crops if often raised on the same land, * * and that they occasion a visible deterioration of it, and a decrease in the succeeding crop. To insure the success of leguminous crops, our farmers confine them to the portions of the land in fallow (half-fallow), and generally to those which are the best on the farm, and to prevent any falling off in the succeeding corn crop, they are liberal of manure even to the extent of stinting other crops. But, by this system, another part of the land is deprived of its fair share of *pabulum,* and this accounts for the fact which we find prominently noticed in the agricultural reports, viz., that since the introduction of pease into fallow culture, the aggregate produce of corn has been proportionally diminished. And, on this account, many excellent farmers still pursue the triennial* rotation, and instead of sowing on their fallow crops of this nature, prefer sowing spring corn; and their neighbours, disapproving of this, are constrained to admit that the corn produce is greater in consequence. On the other hand, the cultivation of leguminous crops on fallow, has this obvious advantage, viz. that their haulms, containing a greater portion of nutritious juices (than the straw of corn crops contains), yields not only a supply of aliment for the farm-stock in general, and especially for sheep, but generates a greater quantity of manure."

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* 1, bare fallow; 2. autumnal grain; 3, spring grain; fallow again.

The concluding sentence contains a sufficient reason for introducing green crops into the fallow system, and, therefore, for substituting half for entire fallows. No one, however, can press more strongly than he does, the necessity of having abundant food of the leguminous and tuberous orders, nor advocate more fully the advantages of housing live stock.

Our limits unhappily prevent us from extending these remarks any farther. We therefore conclude with the reiterated expression of our high estimation of M. Thaër's work, and our hearty recommendation of it to all those land proprietors who can read French or German fluently, and digest what they do read. D.

REMARKS ON THE SALMON.

The natural history of the salmon has been long involved in obscurity, and it is only of late that any considerable exertions have been made to throw light upon it. These efforts, however, have been attended with no small success, and it may now be affirmed that the general biography of this noble fish can be traced with accuracy, from data resulting from numerous and carefully-conducted experiments. The importance of this accession to our ichthyological knowledge will be appreciated, when it is considered how extremely difficult it is—a difficulty amounting, in many cases, almost to an impossibility—to investigate the operations of fishes, owing to the nature of the element they inhabit, especially when, as in the present instance, they inhabit fresh and salt water alternately; and the discovery will be still further valued from its practical bearing on the artificial breeding and rearing of the fish, by which there is a possibility that its numbers may be so increased as to render it generally procurable as an article of food. No very long period has elapsed since salmon was sold in Scotland at twopence a pound; and if the advantages we enjoy for its propagation be turned to proper account, we do not despair of again seeing it brought to the market at a similar price.*

It may not be superfluous to remind some of our readers, that our native streams are frequented by three different species of migratory *salmones*, which, in some of their stages, are liable to be confounded with each other. These are the salmon (*S. salar*), the bull-trout or grey trout (*S. eriox*), and the salmon-trout (*S. trutta*). They may be considered either as salt or fresh water fish, according as we regard the one or the other as most essential to their economy. They invariably breed and execute every function having a reference to procreation, in fresh water; but their principal growth and development takes place in salt water, it being there only that they can find their most nutritious food, and other influences most favourable to their general health. The salmon may be distinguished from the allied species, by observing that the posterior margin of the gill-cover is in the shape of a segment of a circle, the teeth on the vomer confined to the anterior extremity, the caudal fin, or tail, forked, and the pectoral fins dusky on the side next the body. These marks will at least distinguish it in a mature state; when the respective species are very young, they have a close resemblance to each other. The flesh of all of them is excellent, but that of the salmon is greatly superior in richness and delicacy of flavour.

The process of spawning in the salmon, when in a natural state, was not rightly understood in some of its details till lately. The male appears to take no part in preparing the spawning bed, and, indeed, beyond the mere sexual function, gives no aid to his partner, unless in the unwearied diligence he exhibits in warding off the intrusion of rival males. It has been a matter of dispute among observers in what manner the female forms the slight excavation in which the ova are deposited. According to Mr Shaw, the *tail* is the only instrument she employs, throwing herself at intervals on her side, and moving it rapidly, by which a sufficient quantity of gravel is at length displaced, and after deposition, the ova are covered up by a like process. The whole operation of depositing the ova generally occupies three or four days.

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* This, of course, refers to the salmon in a *healthy* condition. We perceive, by a notice in the public newspapers, that salmon have been selling in the streets of Galashiels, during the present month (January), at the rate of 1½d. the pound; kelts, or spawned fish, are occasionally sold on the Tweed at the rate of 3s. per cwt.; and a similar practice no doubt prevails in the neighbourhood of most of our salmon rivers.

It is very likely that in most cases of natural impregnation, a considerable number of the ova fail to come in contact with the spermatic fluid, and are consequently unproductive. But this need not in any case occur when artificial impregnation is resorted to, the process is so simple and effectual. It is easy to ascertain when the ova of a female salmon have reached maturity, because they then leave the ovary, and are found in the cavity of the abdomen ; by gently pressing the sides of the latter, they will make their escape by the sexual opening. A mature male, treated in the same way, yields milt in abundance ; and if held above the expressed ova in running water, the latter will not fail to convey to them the fertilizing influence. If the process be carried on in stagnant water, care should be taken to agitate it thoroughly. The same method may be followed with ova and milt which have been taken out of dead fish, having been previously assured that both are in a perfectly ripe state. It is indispensably necessary to the development of the impregnated ova, that a current of water should flow over them, a continual supply of fresh air, or, in other words, of oxygen, being thus afforded. M. Vogt found that the ova of a salmon-trout, which, it is scarcely necessary to say, spawns in rivers, perished in the waters of a lake ; while, on the other hand, those of a species of Coregonus, *C. palea*, one of the Salmonidæ, did not prosper in river water ; but it is interesting to observe how, by a slight difference of means, the same end is, in this instance, attained. The eggs of the Palea are delivered free, and left to float about among the waves ; thus, instead of the water bringing a continuous supply of fresh air to them, as in the case of the salmones, they may be said to go in search of it, and they find it by a perpetual change of place. In reference to this and similar facts, the writer alluded to expresses his opinion that the ova should always be kept in the same kind of water as that in which the fish are accustomed to spawn. Mr Shaw occasionally placed those on which he experimented in *pure spring water*, and found them succeed; but there can be no doubt that river water, water which, from whatsoever source derived, has been softened and modified by long exposure to the air while running over a shallow bottom, is most congenial to the nature of the salmon. The individual eggs should be kept insulated as much as possible, and not allowed to run into clusters. A very great and sudden change of temperature is likely to be prejudicial, if not fatal, to them; but they can endure a great degree of cold if subjected to it gradually. The eggs have been known to be frozen up in a sheet of ice without injury to the vital principle. The general effect of cold is to retard, of heat to accelerate, the development of the germ. M. Vogt found that a temperature of from + 4° to + 8° R. was best adapted for developing the ova of the Palea; the average temperature of Mr Shaw's breeding ponds during the winter was 40° Fah., while the average temperature of the river during the same season scarcely exceeded 34°. In artificial hatching, therefore, we have it in our power, by a proper regulation of the temperature, to bring forth the young brood much earlier than the natural period of its appearance, and *vice versa*. "In ova placed in a stream of spring water," says Mr Shaw, "the average temperature of which was 40°, the embryo fish was visible to the naked eye by the end of the 60th day, and was hatched on the 108th day after impregnation. That which the same parent deposited the same day in the river, the average temperature of which during the eight following weeks did not exceed 33°, was not visible to the naked eye until the 90th day, and was not hatched until 10th May, that is 131 days after impregnation."

Not only the eggs of the Salmonidæ in general, but even the young embryo, are very liable to be infested by a kind of parasitical plant, which has sometimes proved very destructive to them when attempted to be reared artificially. It is a species of mould, and is probably identical with that which has been found vegetating on fishes in this country, and apparently the cause of their death. M. Vogt describes it as follows:—"It was the means," he says, "of destroying many hundred ova, and it was only by wiping and insulating them that I could succeed in preserving the small number of embryos necessary for prosecuting my observations. When the eggs began to be attacked, it could be seen, even by the naked eye, that their transparency was diminished. The milky spots, of which we have spoken above as indicating decomposition, did not appear; but the whole surface assumed a dirty colour, as if a viscous matter had been deposited upon it. Under the microscope, the egg appeared covered with small opaque grains very closely placed, which are of a whitish tint when the light is intense. We also perceive here and there some small threads on the surface; however, we may still succeed in removing this matter and saving the embryo by carefully cleaning the egg with a fine pencil; but if this precaution be neglected, it is surprising to see what progress the disease has made on the following day. Long transparent threads, often united in tufts or placed round the egg like rays, surround it on every side. Its specific weight has diminished, and it falls but slowly to the bottom of the vessel. It is then useless to attempt the removal of those threads, which adhere so closely to the shelly membrane that they resist the pencil. The shelly membrane itself has become much weaker, and breaks on the least pressure. Examined with a microscope, this mould is seen to be composed of long transparent articulated threads, often inflated at their exterior extremity; the various joints are filled with an innumerable quantity of small granules, which are the sporules by means of which the plant propagates itself. The embryo is then usually dead or much diseased; the pulsations of the heart are less frequent; the various organs undergo atrophy or are irregularly developed. I have seen monsters of every kind among these diseased embryos."*

Artificial hatching of various kinds of fish has been long practised in some parts of the Continent, particularly in Germany, where salmon, trout, and carp, are reared to a great extent in artificial enclosures. Rusconi was among the first that described the development of the ova—his observations relating to the Tench. Several investigations of a like nature have now been made in France and England, and other countries, and their value cannot be too highly estimated, not only in a physiological point of view, but as bearing on the subject of the breeding and management of fish, so as to render them a source of great profit to landed proprietors, and extending the use of them as an article of food, which may be done almost to an indefinite extent.

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* *Histoire Naturelle des Poissons d'Eau Douce de l'Europe centrale, par L. Agassiz. Embryologie des Salmones, par C. Vogt.* This work has just reached this country; it is one of great value. The plan followed has been to take one of the species of the Salmonidae and trace the development of the embryo in all its stages. It is much to be regretted that a *typical* species has not been selected for this purpose, either the salmon itself, or one of its migratory allies. The *Coregonus Palea* may be said to be intermediate between the true salmones and the herring family, its properties being well expressed by the compound terms *salmon-herring*, or *fresh-water herring*. It is besides of limited distribution, and does not occur at all in Britain. These considerations reduce the value of the work in question very much as an illustration of the embryology of the true Salmones, because we are not entitled to infer that what holds true of the Coregoni is likewise exemplified in their more valuable associates.

But to return to the history of the salmon. "On first exclusion," says Mr Shaw, "the little fish has a very singular appearance. The head is large in proportion to the body, which is exceedingly small, and measures about *five-eighths of an inch* in length, of a pale blue or peach-blossom colour. But the most singular part of the fish is the conical bag-like appendage which adheres by its base to the abdomen. The bag is about two-eighths of an inch in length, of a beautiful transparent red, very much resembling a light red currant, and, in consequence of its colour, may be seen at the bottom of the water when the fish itself can with difficulty be perceived. The body also presents another singular appearance, namely, a fin or fringe, resembling that of the tail of the tadpole, which runs from the dorsal and anal fins to the termination of the tail, and is slightly indented."*

They do not, while in this state, leave the gravel among which they were hatched, being still too feeble to encounter the flowing stream. But before a long period elapse, the bag contracts and disappears, the continuous membrane gives way to the ordinary number of fins, the colours gradually deepen, and when about an inch in length, the transverse bars are visible on the sides, and the whole characteristic attributes of the fish are developed. The head, however, is still rather disproportionately large, and the body tapers off towards the tail more rapidly than at a subsequent period of its growth. In salmon rivers, the fry may be found in this condition from the beginning of April to the end of May, frequenting the little creeks and bays where the current is but slightly felt, and associated with the young of other species of salmones, all of which have such a close family likeness, that they are easily confounded with each other. As they acquire size and strength, they become less gregarious, a circumstance partly occasioned by the demand for a greater supply of food, and repair in small parties to the shallower parts of the river. But, according to Mr Shaw, they continue comparatively unobserved throughout the whole of the first summer, being seldom taken by the angler during that season. In the following spring, however, now entering upon their second year, they appear in the streams, and become conspicuous from their increased size and considerable numbers. They are now in fact the ordinary *parr*, a fish so well known to every Scottish angler, even though he be the merest tyro in the gentle art. The ordinary length may be stated to be from five and a-half to seven inches, although it has been found to reach nine and a quarter. The body is deep in proportion to its length, the head rather blunt, the tail deeply forked. The formula for the fin rays is as follows:—

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* Trans. Royal Soc. of Edin. vol. xiv. p. 552.

1st D. 12; P. 13; V. 8; A. 10; C. 19.

The pectoral fin is more rounded at its extremity than in any other of the Salmonidæ, at least in a mature state. The teeth are small and sharp; the whole bones of the skeleton extremely delicate; the flesh white. The colour of the back and sides is olive-brown, marked with numerous small rounded dark spots; the sides with a row of eight or nine broad abbreviated dusky bands, or transverse spots, a kind of marking common to the young of many of the Salmonidæ, but the marks are narrower in this case and more lengthened. Between each or most of these dusky marks, there is a round orange-coloured spot, and a few others are scattered about irregularly. The operculum or gill-cover has commonly one or two distinct rounded black spots.

These characters are of importance, because, if closely observed, they will enable us to distinguish the parr from the young of the salmon-trout (*S. trutta*) which it greatly resembles. Judging of the latter from a beautiful figure in Sir

William Jardine's British Salmonidæ,* taken from a specimen obtained from Mr Shaw's ponds, the chief distinctions seem to consist of the more rounded shape of the lateral spots, the lunate form of the notch in the tail, and the brighter colouring, in which there is a considerable mixture of yellow; the operculum also, instead of one or two well-defined black spots, has several small dusky ones. The young of the bull-trout (*S. eriox*) is no doubt very similar to this, while that of the common trout is so like, that it is scarcely possible for an unaccustomed observer to distinguish them. The comparatively rounded shape of the extremity of the pectoral fin, to which Mr Swainson assigns so much importance as a proof of the specific distinction of the parr, is a characteristic of the young of all the migratory salmones; in a mature state, the fin in question is invariably pointed. In the state of parr, the young salmon occur in great plenty in most of our Scottish rivers, delighting in clear running streams with a gravelly bottom. They commonly congregate in small shoals, and remain in a state of great activity at all times of the day, and apparently in all states of the weather. Unlike the timid and capricious trout, their frequent companion, they seem to feed at all times, and are ever ready to take a bait. They are more plentiful in the lowlands of Scotland than in the north, although the very reverse of this takes place with the mature fish. It is a curious circumstance stated by Lowe, in his Fauna Orcadensis, that the salmon is so rare in Orkney, that its occurrence is looked upon as a wonder, while the parr is pretty frequent in the shallower lakes and clear burns. It is very likely, however, that there is some mistake in this; although a similar assertion has been made with regard to arctic rivers generally, namely, that although the salmon actually swarms, parr have not been detected in them.

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* This work is not only the most beautiful pictorial illustration of the Salmonidæ we possess, but one of the most sumptuous publications that has appeared in this country on any branch of natural history. The drawings are exclusively from the author's own pencil, and possess the highest merit as works of art, while they are most characteristic delineations of the objects. A volume of letter-press is in preparation, which we have no doubt, from the attention the author has long bestowed on the subject, will be a worthy accompaniment to such plates.

Strongly characterized as the parr is, and apparently bearing all the marks of specific individuality, it is not surprising that most of our best naturalists should have considered it as a well determined species. Nearly all our older naturalists regarded it in this light, and most of the modern ones have followed their example. Some conjectured that it was a mule —the offspring of a trout and salmon. Sir H. Davy, who seems to have entertained very loose notions respecting the limits of species, inasmuch as, considering the sea-trout as the type, he regarded all other true trouts as varieties, supposes the parr to be a hybrid between the sea-trout and common trout. The notion that the fish in question is a certain state of salmon fry, is of old date. We find Pennant endeavouring to refute this opinion, which was advanced by some of his predecessors, and many others attempting to establish it;* but until the appearance of Mr Shaw's experiments, all was conjecture on the subject.

It is certainly one of the most extraordinary circumstances connected with the subject, that, among parr, there is such an overwhelming preponderance of males, and that, in these males, the milt is in a state of maturity. Of the many dozens opened by the writer of these desultory remarks, in the course of the last autumn, not one female was found; but the latter sex occasionally occurs, with the roe in a pretty advanced condition. Having observed that male parrs, with the milt matured, and flowing from the body, were at all times in company with the adult female salmon while depositing her spawn, Mr Shaw conceived that they might seek each other's company for sexual purposes; and upon impregnating the spawn of a female salmon weighing 14 lb., with the milt of a parr weighing 1½ oz., the process succeeded in every respect, the young appearing at the usual time, and continuing in the utmost health and vigour, with all the ordinary characters, up to the time of assuming the migratory dress. Many experiments of a similar kind were made, invariably with the same results, so as not to leave the smallest doubt of the fact, that a male parr can effectually impregnate the ova of a full grown salmon. It was also proved that the offspring of a parr and salmon can in like manner propagate their kind, and it is thus thought to be demonstrated, according to a recognised law in the economy of nature, that such offspring could not be a hybrid, but the natural produce of two sexes of the same species.

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* It is to be regretted that Mr Yarrell, one of the greatest of modern authorities on ichthyological subjects, has not given his opinion on what may be called the parr question, in a more definite and satisfactory form. In the last edition of his work, he gives the history of the salmon nearly as it appears in works of old date, and then extracts Mr Shaw's paper, without attempting to reconcile certain discrepancies, or assist his reader in coming to a satisfactory conclusion.

It seems highly improbable that this ill-assorted partnership is ever formed when the fish are left in a natural state.* Mr Shaw thinks otherwise, because he observed the male parr frequently in company with spawning salmon. But it may be observed, that this could scarcely be otherwise, for the streams in which salmon breed, are just those which parr delight to frequent, and they are usually so numerous, that they may be seen in most places. The female salmon, moreover, have legitimate partners of their own size and age, known to execute the proper function of their sex, and it is not in accordance with the general economy of nature, that these functions should be devolved on two separate and dissimilar states of the same animal.

It is difficult, or rather in the present state of our knowledge, it is impossible, to form any idea to what extent fish of different species may breed with each other, where artificial means of impregnation are resorted to, and to what extent mules thereby produced may be prolific. It is a mistake to suppose that, even among animals of higher rank in the zoological scale than fishes, mules are always steril with individuals of unmixed descent. It is well remarked by the editor of a recent edition of Cuvier's Animal Kingdom, that it may well be questioned whether there be not different degrees of fertility in hybrids, corresponding to the amount of affinity, or physiological accordancy, subsisting between the parent races; and surely a stronger case of close affinity cannot be adduced than the present. The genus Salmo is as strictly a natural one as any in the whole range of zoology; and when we consider what facilities are afforded for artificial interbreeding, owing to the mode of propagation peculiar to such fishes, we cannot help thinking, that the greater latitude we assign to them in this respect, the more likely are we to be near the truth. It is not necessary, for the purposes of generation, that the fish should ever approach each other; the young, in some instances, are as capable of propagation as old individuals; *nay, the species may be propagated a considerable time after both parents are dead!* All these circumstances are so peculiar, as nearly to prevent all reasoning from the analogy presented by other animals, and ought to prepare us beforehand for the most remarkable results when artificial intermixture is resorted to. Difference of size, and physical disparity of parts, which may often be the sole cause of the barrenness of hybrids among other classes of animals, can here have no influence. The circumstance of an immature fish,—one in a comparatively young state,—being capable of continuing its kind, is, as Mr Shaw justly remarks, an extraordinary departure from the ordinary laws of nature. It is certainly a greater deviation from the ordinary mode of procedure, than the prolificacy of a mule would be, especially under such circumstances as the present. Keeping these, and some other considerations, in view, we cannot help coming to the conclusion, that all the migratory salmones, native to this country, as well as the common trout, will readily propagate with each other, if artificially impregnated, and that the hybrids thus produced will retain the power of continuing the race, at least for some generations. To what precise limit this power may extend in the latter, it is, of course, impossible to conjecture: it is not impossible that it may be continued in perpetuity; the fact, however, can only be determined by experiment, for which it would form an interesting subject.*

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* Mr Shaw's inductions are not always very logical. He says, that in order to *demonstrate* the fact, that the male parrs were present with the female salmon for a sexual purpose, he impregnated the ova of the latter with the milt of the former, and the process was successful. The only legitimate inference from this is, that the milt of the parr was capable of fertilisation; any other is a non-sequitur.

Towards the conclusion of their second year, the larger parrs observable in rivers in autumn, winter, and early spring, begin to assume a different aspect, and are converted into what are called *smolts* or salmon-fry. They are now between six and seven inches long, of a fine deep-blue upon the back, with a delicate silvery appearance on the sides, and the abdomen white; the scales deciduous, or coming off easily on the hand (Shaw, p. 548). In this state they migrate to the sea.

So far we are indebted to Mr Shaw for the history of the salmon, that is, as long as it continues to be a denizen of fresh water. The subject has recently been taken up by Mr John Young, Sutherlandshire, and he has supplied what was still necessary to complete the history of the fish. He entirely agrees with Mr Shaw as to the early or fresh-water life of the salmon; and then shews, by frequently repeated experiments, the extraordinary increase of dimension the smolts undergo after reaching the influence of the salt-water. He marked a number of descending smolts, by making a peculiar perforation in the caudal fin, by means of small nipping-irons constructed for the purpose. He recaptured a considerable number of them ascending the river as grilse, in the course of the ensuing months of June and July (they had descended in April and May), and weighing several pounds, each more or less, according to the difference in the length of their sojourn in the sea. Again, in April and May (1842), he marked a number of descending smolts, by clipping off the little adipose fin on the back. In June and July he caught several of them returning up the river, and bearing his peculiar mark, the adipose fin being absent. One marked in April, and recaptured on the 25th July, weighed 7 lb.; the other marked in May, and recaptured on the 30th July, weighed 3½ lb. As the season advances, grilse increase in size, those being largest which abide longest in the sea; and they spawn in the rivers *before they have become adult salmon.*

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* If the offspring of the migratory *salmones*, produced by crossing what we now regard as distinct species, were found to be permanently prolific, the question might then very naturally arise, whether they are not mere varieties derived from a common original. But a like result attending the interbreeding of one of these with the common trout, would, of course, authorize no such inference, because the specific distinction of the latter admits of no question.

Mr Young then traces the transition of the grilse into salmon. He marked many small grilse after they had spawned in winter, and were about to redescend to the sea. He recaptured them in the course of the ensuing summer, as finely formed salmon, ranging in weight from 9 to 14 lb., the difference still depending on the length of their sojourn in the sea. He has tried these experiments for many seasons, but never twice with the same mark. A specimen, marked as a grilse, of 4 lb., in January 1842, and recaptured as a salmon of 9 lb. in July, bore a peculiarly twisted piece of copper-wire in the upper lobe of the caudal fin. Those marked and retaken in 1841, were marked with brass-wire in the dorsal fin. Thus, the possibility of any mistake as to the lapse of time, was effectually guarded against.

One of the results of these interesting experiments, is the positive proof that grilse and salmon uniformly return to their native stream. This, indeed, was formerly supposed to be the case, on pretty satisfactory grounds, such as slight varieties of salmon being confined to particular rivers, but it may now be considered as demonstrated. Mr Young is of opinion that salmon rather *diminish* than increase in size during their abode in fresh water.* Mature salmon appear to acquire as great a proportionate accession of size and vigour by their visit to the ocean as smolts and grilse. A spawned salmon, weighing 12 lb., was marked on the 4th of March, and was recaptured on its return from the sea on the 10th July, weighing 18 lb. The principal cause of this extraordinary growth is no doubt the nutritious food they obtain in the ocean, apparently consisting chiefly of minute crustacea and the eggs of echinodermata, although they occasionally consume small fishes of various kinds. These seem to be digested and assimilated with extraordinary rapidity, and to this circumstance, in a great measure, is probably owing their rapid improvement in condition.

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* This may be true in those cases where the fish are left to follow their natural instinct in visiting the salt-water. But it has been proved, by many trials, that they can exist permanently in fresh water, undergoing, in a modified way, their various changes, and gradually increasing in size, although never exhibiting the vigour and beauty that belongs to them in a natural state.

There are many other interesting matters connected with the history, both natural and statistical, of this valuable fish, on which we cannot now touch. It is a subject of congratulation that we now understand the principal points in its history, which have been so long shrouded in obscurity. This is a result interesting, not merely to the natural historian, but to those who are actuated by the philanthropic object of providing additional supplies of food for the million, a necessity which is becoming every day more urgent. No one, we think, can consider for a moment the immense and inexhaustible supplies of wholesome and palatable food to be derived from the ocean, without lamenting that they are made available to comparatively so small an extent. Most part of our inland population are almost unacquainted with salt-water fish, in a fresh state, as an article of food. And yet how easy would it now be by extending our fisheries, and taking advantage of rapid inland communication, by railways for example, to afford them an abundant supply! It is true that the demand for an unusual kind of food might not, for a time, be such as to afford much encouragement to the venders; but the supply would soon create the demand, and a profitable traffic, after being established, would more than compensate for the original outlay. The promotion of such an object as this is well worthy the notice of some of our national societies. But to regard the matter more immediately in reference to the subject of the present notice, it may be remarked that no long period has elapsed since hinds and farm-servants in some of our more northern counties, in making an agreement with their masters, stipulated that they were not to be compelled to have salmon at their meals more than three or four times a-week. Now they are as much strangers to their boards as other modern luxuries, or if they do at times make their appearance there, the probability is that they have been obtained by illicit means. And while this is the case with our poorer population, how have the more wealthy, in many parts of the country, been circumstanced in regard to the same matter? Throughout a large portion of the south of England, during the last season, salmon has been selling at the rate of *three shillings* a-pound! These evils we have it now in our power, in a great measure, to remedy. The wholesale destruction of parr, while we were ignorant what they were, was in some measure excusable: they afford pretty fair sport to the angler, and can moreover be obtained when no other fish will rise to his lure. In such seasons as last, when the waters were much reduced, scarcely any thing else could be caught but parr. Every schoolboy filled his basket; the herd-boy, with his hazel-rod, drew them out by dozens; and we ourself often carried home three or four dozens, after a few hours' fishing, from the "silver-tide" of the Teviot. An average day's fishing, in such a river as that just mentioned, when every thing is taken that comes to the hook, in compliance with the apophthegm, that "small fish are better than none," would probably amount to six dozen of parr. Mr Young's researches now enable us to affirm, that, in the course of a few months, these would have been grilses, each weighing several pounds, say 4 lb.; so that by such a single day's work we destroy what would soon have yielded about 228 lb. of delicious food. As long as parr and smolts are captured in such multitudes, salmon must, of course, continue comparatively scarce; and we are apprehensive that any legislative prohibition in regard to the former would necessarily have to extend to the common trout, as they are taken by the same baits, and thus one of our most agreeable and healthy out-of-door amusements would be almost completely interdicted. But if any legislative measure be attempted, it is satisfactory to know, that it can now be founded on an accurate knowledge of the general history of the fish, the want of which, in former times, went far to neutralize any such measure. If we are to believe Isaac Walton, anglers are always better than other men—more contemplative, considerate, philanthropic,—but, with all deference to that respectable authority, we should not be disposed to trust much to the efficacy of an appeal to them to spare the young salmon from a sense of duty, and from the consideration of the benefit they would thus confer on the community. But, exposed as they now are, and as we fear must, to some extent, continue to be, to many causes of destruction, the way to make the most of present circumstances is to hatch the young in enclosed sheets of water near the sides of rivers, in the manner practised by Sir F. Mackenzie, a process which can be followed in such way as to increase their numbers almost *ad infinitum*, and at the proper time, pour the shoals into the river. They must escape for a time from the control of their breeder, but they will not fail to return again to the vicinity of the spot whence they set out, urged thereto by a more certain and unerring guide than any which human means could supply. By acting extensively on this method, the salmon will become a much more common and accessible article of food than it now is, notwithstanding all the hostile modes in which, during the various stages of its growth, it is liable to be assailed.

AGRICULTURISTS' NOTE-BOOK.—NO. XXI.

The consequences of Experimental Farming, without previous Experience, exemplified in a Dialogue between two Country Gentlemen. Imitated from the French. By MARTIN DOYLE.

Sanguine. I come to bid you farewell, my Dear Sir, and to ask if you have any commands for London, where I have taken a house, and where I hope to live for the remainder of my life.

Steady. What! and give up your farming operations!

San. Yes. I shall never open my mouth again about ploughs or harrows, or thorough-draining, or any other country matters. I am almost beggared by farming. Allow me to make you a present of a set of confounded books on husbandry; you will oblige me by taking them, for otherwise I shall burn every one of them.

Steady. To save them from such a melancholy fate, I shall accept your obliging offer; but, perhaps, they are not so blameable as you think.

San. Just listen to me—it is the last time that I shall ever deliberately touch upon the hateful subject—and you will see how far the books have been the cause of my failures.

Steady. I shall be happy to hear what you have to allege against them.

San. You know the cause of my coming here.

Steady. Not exactly.

San. I had a tenant named Hogg [Steady nods,] who held 250 acres of my property, and who was as provokingly ignorant of alternate husbandry as I am of embroidering my wife's flounces; and who went on the old system of a fallow every fourth year, and three crops of corn in succession.—Just think of that.

Steady. Very bad management indeed. I recollect Hogg's management perfectly—his meadows, too, were undrained, and never manured.

San. Exactly so; and the produce was nothing but a scanty supply of coarse herbage, with a great proportion of rushes. Now, what rational landlord would tolerate such gross mismanagement? [Mr Steady gives another nod.] Well, sir, I sent Mr Hogg about his business at the termination of his lease, taking at a valuation his horses, cattle, sheep, and even some of his farm implements, which were not too bad for use; and then I determined to give an example of the best husbandry to all my tenants, and the gentry around me. I went to work—with a set of books at my elbow, as if they were an infallible cabinet council. The first thing I did was to sell off Hogg's long-legged and long-tailed native sheep, and to buy in their place a lot of heavy Leicester, with a ram that cost me L50.

Steady. What! before your land was able to feed them?

San. Even so. I got rid of the common breed of cows, which I thought were a disgrace to my farm, and sent off to the north of England for a lot of short horns, including a high-bred bull, for which I paid L.100.

Steady. And perhaps you never had less milk and butter in your life.

San. Never, sir—never; and as to fat cattle for the market, I had not a single one. My whole stock of short-horns was half starved, and they got the distemper into the bargain.

Steady. But, my dear sir, how could you have expected to maintain that large description of cattle on your bare pastures, and before you had any artificial summer green food for them; and not a turnip, I believe, in prospect for their winter keep?

San. Why, sir, some villanous author persuaded me that they could be kept in good condition during the winter on straw.

Steady. And so they could, and be fattened on it too, *provided* they had plenty of oil-cake with it.

San. But I had neither straw nor oil-cake; for having given up the notion of sowing more than a very little corn that year, as I conceived that the ground was heartily tired of it, I had hardly any straw, and what I had was consumed before the beginning of February, when I found it impossible to purchase any; and hay was enormously dear, and scarcely to be had even for a high price.

Steady. But you neglected to sow turnips?

San. I did not. I had commenced in Spring the thorough-draining of a field, containing twenty acres, for the purpose of growing a crop of Swedes, but unluckily the weather was very wet, and besides this some necessary alterations, which I made in the draining, and a disappointment afterwards in the arrival of a cargo of tiles from Glasgow, prevented me from finishing the work until two months after the crop should have been above ground.

Steady. The produce, of course, was——

San *Nil—nulla bona*—as the sheriff says in his returns.

Steady. May I ask about the nature of the alterations which you made in your mode of draining?

San. I had read in one book that the drains should be cut across the fall; and my field sloped a good deal, and I had the whole surface intersected with drains, 20 feet apart, and at right angles to the descent. Well, just as I was preparing to have them lowered, another book informed me that they should be made obliquely, at an angle of about 45 degrees with the inclination of the land; and as I did not wish to have the farmers of the country laughing at me afterwards for my ignorance of the improved plan, I had those drains filled up again with the earth that had been thrown out, and I set the labourers at work to form the oblique drains.

Steady. These answered your purpose however——

San. They might have done so no doubt, but (I have not yet concluded my story), just as they were finished, I got hold of Mr Smith's pamphlet on thorough-draining, and was immediately convinced by his reasoning, that the oblique drains were wrong also, and I had them filled up again with earth [Mr Steady shakes his head], and made new parallels directly up and down the slope at 12 feet apart; so, altogether, Mr Steady, the draining of that field cost me a pretty round sum; and besides, sir, I went to the expense of carting off all the yellow clay that had been thrown out of the drains; though I now see clearly that it might have been thrown over the stones or tiles, as the water would have entered into the drains at the sides. Then, sir, I sent to Drummond's for one of Smith's subsoil-ploughs, and found that the small horses which I had bought from Hogg were not able to draw it; so that I was obliged to buy six Clydesdales, and when they arrived at my farm some other work pressed so hard, that I could not subsoil for that season, and was obliged to employ those fine horses in petty farm labour, and drawing materials for my new building.

Steady. Which Hogg's horses would have done equally well——

San. Now I see clearly that I was wrong in incurring so much unnecessary expense at starting; but the truth is that I wished to see well appointed teams as soon as possible, and apropos of this, it cost me a good deal to replace Hogg's old carts and drays with new Scotch ones, though the old ones would have done for all my rough work nearly as well.

Steady. Gentlemen often waste much capital by extravagance of this kind; in the purchase of high-priced machines, there is a great want of judgment very frequently. By the way, you have a thrashing-mill, and if you wish to dispose of it——

San. You may have it at half what it cost me; I put it up before I had a bushel of corn sown, and the very first day on which I tried how it would work, an unfortunate labourer, with a large family, lost one of his hands, by awkwardly letting his fingers slip between the rollers; poor fellow, amputation at the wrist was necessary, and I could not do less than settle an annuity of L.20 a year on him for his life.

Steady. Well, that at least was not money thrown away——

San. No, but it is an item to the debtor side of my farming speculations.

Steady. But surely, though you mismanaged your draining so much, and lost your crop of turnips in the first instance, you had a splendid crop in the ensuing season on the same field, which I suppose you had manured in the previous year for the expected Swedes?

San. There again I was unfortunate, and entirely owing to books. I had been studying Sir John Sinclair's essay on the manufacture of farina from potatoes, and the modes of preserving potatoes from year to year by kiln-drying. Mine had been kiln-dried; and when the season came round for planting, some of my work-people who had been unaware of what I had been doing with the large stock of potatoes in an out-house, cut them for sets, and planted them, while I, entirely ignorant that the vegetating principle had been destroyed, felt no misgivings on the subject. No potatoes grew, as you must know, and when the matter was enquired into, I actually bribed the labourers to propagate the report that the crop had failed from *dry-rot*. Well, sir, we tried turnips early in July, and they came up well; but in order to secure them from the fly of which I had read much, I applied a solution of salt in such profusion, that I killed every plant.

Steady. (Laughing). Well, this was certainly a sad blunder, but you must admit that Sir John Sinclair gave you no reason for supposing that kiln-dried seed of any kind would grow, and I suspect that you made your solution of salt vastly stronger than the prescription warranted. I remember that Hogg used to make a good deal of money by the orchard of Crofton apples; that of course has yielded as formerly?

San. Bless you no; I'll tell you all about that too. Hogg always let his cows have the run of the orchard in winter and spring; and they ate off or broke down all the lower branches, so as to prevent the trees from wooding too much. This system I put a stop to, and closed up the gate by which the cows used to enter, and the consequence was that the trees ran so much to wood, that I had no crop. Hogg's mode of pruning with cows' mouths and horns, had been really efficacious, though no one could have supposed that such rude and unscientific practice would have succeeded.

Steady. Whoever takes this farm now will reap the advantage, however, of your unsuccessful outlay. You have been, I suppose, ploughing a good deep furrow, and to my knowledge Hogg never gave any thing but a scratching to the land.

San. Aye, but his scratching brought him crops, which my deep ploughing has failed to do.

Steady. How?

San. Unfortunately, I insisted that the ploughs should go deep into the under till—which is the worst kind of yellow clay—and bring it to the surface, and the consequence is, that I have poisoned my land. In short, my good neighbour, I have had no return at all for my expenditure; and I leave my malediction on all writers on husbandry, from the greatest to the least, from Jethro Tull down to Martin Doyle.

Steady. Oh! pray, except Doyle—whatever you may do with all the rest; there are no crotchets in him. I myself have just bought the tenth number of the new edition (in monthly one shilling numbers) of his Cyclopædia. If you will follow the plain and well-selected advice which that experienced writer affords——

San. Hang me if I do—(in a violent passion). No, sir, I shall make no exception whatever; they are all a parcel of humbugging, ignorant——

Steady. My dear Mr Sanguine, be composed; believe me, you have misapprehended many things, and not exercised discrimination. Excuse my freedom; you have taken isolated cases instead of looking at the *whole;* and you have ventured to act for yourself in matters requiring skill and experience, without possessing either of those qualifications. If a surgeon writes an able work on surgery, does it follow, that a man who has been uninstructed in that art can exercise the knife, the probe, or the saw? The books are not so much to blame as you think, for they all presuppose a knowledge of farming to be possessed by the readers of them.

San. Yet, if they give erroneous directions, even a professional farmer may be misled by them. For instance, I read somewhere that a few stones of wheat would be sufficient to sow an acre, and that thick-sowing is worse than waste of seed; and I tried 4 stones of barley to an acre, in drills—why, sir, I had not more than the third part of a crop.

Steady. At what distances were your drills?

San. Eighteen inches.

Steady. No wonder that you were disappointed. Now, I will venture to say that the writer referred to wheat only, and that he intended horse-hoeing, on Tull's principle.

San. Exactly so. But if this treatment was good for wheat, I took it for granted it ought to be good for barley.

Steady. By no means: there was *your* ignorance (excuse me), and not the error of the writer; you applied to one kind of grain the instructions given respecting another, and under peculiar circumstances: did you horse-hoe?

San. No, for I sowed clover seeds with the barley.

Steady. Well, even if you had, your field would not have yielded half a crop, because barley does not tiller as wheat does on every fresh stirring of the earth, and acquire the same invigoration and extension in consequence. The book was not to blame in this instance, nor is it the science of agriculture—as far as I can judge from what you have stated—that is in fault, but your misapplication of its principles. Writers on this subject, as on others, no doubt often publish a great deal of nonsense; but a prudent reader cannot be misled, if he has discretion enough to receive new-fangled opinions, which are in opposition to uniform practice, with great caution, to weigh well all the circumstances, and to adopt the new suggestions slowly, and not until the test of experience has established their correctness. One should begin with experiments on a small scale, and not change the entire system in a moment, as you have done: you drained too extensively at starting, and *that* before you had ascertained the best method of doing it; then you undid your work as inconsiderately as you had commenced it—you abandoned the system of fallowing all at once, without having a better to succeed it. To take two or three successive corn crops, is contrary to all good theory and practice; but you contrived it so as to have hardly any crops at all. You went at once to an opposite extreme, and deserted the old system before you had established the new, without reflecting that the transition-state should be slow, and suited, in all its proportions, to the new and untried circumstances to which it is to pass. A new arrangement of farm management should be effected as a manufacturer changes from one branch of manufacture to another: he cautiously and prudently makes his pre-arrangements, and does not abandon the one manufacture until he is ready to commence the other in a well-organized and effective manner; he calculates his probable profits at the lowest rates, and his losses at the highest, with an ample allowance for unfavourable contingencies.

San. I have unfortunately acted in the contrary way, and deceived myself in consequence in every item, in proportion to my over-sanguine expectations. For instance, I anticipated from the field which I drained in so needlessly expensive a manner, a great return; and when I bought improved ploughs, and insisted on deep furrow slices, in defiance of the advice which my ploughmen gave me, and the infertility of the subsoil, I calculated on an *immediate* increase of productions.

Steady. Just so,—and that reminds me to remark that you ought to have brought up the subsoil very gradually, in successive years, allowing time for the atmosphere and manures to fertilize each thin layer of clay brought to the surface, and not to have incorporated in one season an overwhelming mass of bad matter with the shallow surface earth, from which old Hogg would have had a good crop of oats. Then, again, Mr Sanguine, in attempting all at once to bring in the alternate system, you made great mistakes; for example, in buying cattle to consume green food, which was not even in a growing state, and in rejecting corn crops before you had made adequate preparations for replacing them with artificial green crops.

San. Between the two stools I have fallen to the ground completely.

Steady. And I believe that you dismissed a very intelligent and prudent though old-fashioned steward, though you had not experience yourself to undertake such great land improvements, without a practical guide at your elbow; but, as you have very candidly said that you *have* fallen to the ground, I must be permitted to express my deep regret at the circumstance, both from apprehension of the consequences which may result to this country—where agriculture is so defective—from your failure of success and consequent distaste to rural improvement, and from the loss which I shall individually sustain by the removal of so kind and valuable a neighbour [Mr Sanguine bows, he could hardly do less] from this district. The consequences to which I advert are these;—the obstinate and unimproving farmers will be now more than ever convinced that their old plan of fallows and crops of corn while the ground can yield them, is the best, and that all innovations on this practice, however really necessary and excellent in themselves, are to be avoided. They will refer to your mistakes as unequivocal evidences of the folly of new schemes, and triumphantly say nothing would satisfy Mr Sanguine but deep ploughing, and the mischief a blade of corn he had for his pains,—he must have turnips, and where was his crop? and then, the poor misguided gentleman must drill his barley, —and what was the end of it? Why, he had not the third part of a crop,—the cattle of the country were not good enough for him, and the big ones he brought here were starved, and scarcely gave a sup of milk, and he was often obliged to buy butter for his breakfast,—the poor foolish gentleman.

This was neither very complimentary nor consolatory to the unfortunate speculator in land improvements, but it was very true. The gentlemen parted with mutual expressions of good will and regret, and in about a month afterwards, an unimproving but wealthy farmer of the old school was established in the farm which Mr Sanguine so hastily relinquished, and from all that the former (who was not bound by any obligations as to a routine of culture) perceived of the proprietor's mismanagement and abortive undertakings,—the 20 acre field, however, was an unequivocal and perpetual record of the advantages of complete draining,—he was confirmed in his opinion that the old and now almost exploded method was the best.

I conclude with the rather too brilliant similitude of the very sensible French writer whom I have endeavoured to follow as closely as possible in the foregoing sketch :—

> "In agriculture, as in every thing, nothing permanently good can be effected in a moment. *Time does not spare what is done without him.* Imitate Nature in her order of the seasons and the development of her phenomena. Between the rigour of winter and the heat of summer, she has placed autumn to harmonize between these two extremes. Between daybreak and noon there are many intervening hours: the sky is tinged with many shadowings before it appears in all its brilliancy. So, in order to bring a farm to perfection, it must pass through many stages. Agriculture, like many sciences of enquiry and observation, consists in a perpetual investigation, and while all its principles and fundamental rules could be comprised in the smallest duodecimo, ten quartos would not contain all the exceptions. To observe—to feel one's way—to make an experiment—to advance—to recede—to enlarge—to contract, with due regard to the quality of the soil, the temperature of the seasons, and the success of different crops,—why, this is the whole art."

Spirit of Chemical Research: abuse of a Theory. By Mr Towers, M.R.E.A.S.—In a recent article the advance of agriculture was attempted to be proved by the circumstance of the diffusion of scientific inquiries; and the almost universal introduction of philosophic and chemical phraseology was considered one of the signs of the times; but every thing is liable to abuse, and they who endeavour to erect a superstructure, even upon the sure foundation of experiment, must compound for misconceptions, if not for wilful misrepresentation.

The above remark has been elicited by the perusal of a letter in the Mark Lane Express of 2d of last January, which, as it contains much that is worthy of reflection, is copied almost verbatim: it is headed "*Agricultural action of Bone-Dust.*" The writer had just perused with surprise a Mr Prideaux's letter on that subject, and observes,—"He" (Mr P.) "says, the specific effects of bone-dust seem to depend on its principal ingredient; and this, according to the authority he gives, is *phosphate of lime.* Now, if this supposition were correct, horse bones must be of more value to the farmer than those from oxen or cows; but it is a well established fact, that horse bones never bear the same, nor near the same market-price, as kitchen bones. Mr Prideaux quotes the analysis of Berzelius, which estimates cow-bones to contain about 50½ per cent. of phosphate of lime. M. Merat Guillot estimates the phosphate of lime in the bones of the horse at 67½ per cent. Fourcroy and Vauquelin's experiments shew ox-bones to contain about 37 per cent. of the same constituent. Horn is allowed to be a more powerful manure than bones, but Mr Hatchett only obtained about 1½ grains of phosphate of lime from 500 grains of ox horn."

The writer has, in the above passage, brought forward the substance of what Davy advanced in his sixth Agricultural Lecture above thirty years since; and his object is evidently to prove, that they are under error who ascribe the fertilizing properties of animal bones to the phosphate of lime which they contain. "The basis of bone" (according to Davy) "is constituted by earthy salts, principally phosphate of lime, with some carbonate of lime and phosphate of magnesia; the easily decomposable substances in bone are fat, gelatine, and cartilage, which seems of the same nature as coagulated albumen. According to the analysis of Fourcroy and Vauquelin, ox-bones are composed

Of decomposable animal matter, .	51.
Of phosphate of lime, . . .	37.7
Of carbonate of lime, . . .	10.
Of phosphate of magnesia, . .	1.3 = 100 parts.

"M. Merat Guillot has given the following estimate of the composition of the bones of different animals:—

Bone of calf, . . .	54	phosphate of lime.
Bone of horse, . . .	67	do.
Bone of sheep, . . .	70	do.
Bone of hog, . . .	52	do.

"The proportion of carbonate of lime in each is little more than 1 or 1½ per cent., and therefore he infers that 'the remaining parts of the 100 must be considered as decomposable animal matter.' 'Horn is a still more powerful manure than bone, *as it contains a larger quantity of decomposable animal matter*.'"

We here perceive that our writer has adduced, fairly, the the evidence of the first agricultural chemist, and thus has enlisted him on his side. Davy manifestly leans to the opinion that the chief fertilizers are the decomposable animal substances with which bones and horn abound, and not the earthy basis: analysis and observation can alone produce decisive evidence; but in the mean time it may be safely asserted that these enquiries and doubts afford decisive proof of the spirit of research which is now abroad.

"The powerful effects of urine," he continues, "from cattle-stalls is universally understood, yet this substance, we are told by an eminent chemist, contains only 3 per cent. of phosphate of lime. Guano has latterly become much used as a manure, and in many instances it has answered well; yet, according to the analysis of two eminent French chemists, it contains but a very minute proportion of phosphate of lime. Pigeons' dung is well known to be a powerful help to any crop, but night-soil is the most invigorator to poor land of any substance I ever tried: this quality, however, it does not obtain from phosphate of lime."

These remarks are very pertinent; but it is evident that the writer, in his zeal to upturn the theory of another and depreciate the value of phosphate of lime, has introduced matter altogether irrelevant. Of this more hereafter. But in the mean time we would impress the necessity of economy in all things, particularly as respects the resources which are at command and entirely independent of foreign assistance.

In the agricultural newspapers there are now advertised thirty or forty manuring substances, which are either manufactured at home or are imported at considerable expense. This speaks of research and industry; but at the same time it reminds one forcibly that the English are a nostrum-loving people. The great point at which every intelligent agriculturist should aim, is a knowledge of the constituents of those crops, white or green, which his land produces in the greatest perfection. A poor, stunted, yellow vegetable is no specimen; but when the herbage is verdant and healthy, and the mature plant sound and productive, every such subject ought to be rigidly analyzed, in order to ascertain what soluble salts and insoluble matters are traceable in its ashes. This knowledge once attained, promises to lay a foundation for the science of manuring. True it is, and the fact ought to be seriously weighed, that, though chalk, potassa, soda, and siliceous earth be found in the ashes of a plant, they did not exist as such in the living vegetable: all were masked, for all were united with certain acids, which rendered them soluble and liquid. These acids being resolvable into the common elements of vegetable substance, namely, oxygen, hydrogen, carbon, and occasionally azote, are decomposed during combustion, and then release the alkaline or earthy bases with which they were united.

We have thus traced, in general terms, the components of vegetable organized beings, so far as chemistry is concerned, and the conclusion is simply this, that oxygen, hydrogen, carbon, and nitrogen, are united to each other in various proportions, producing decomposable substances, which hold specific affinities with certain fixable bases that remain in the ashes of combustion; and, therefore, that as common manures contain all the elements before named, but are perhaps deficient in, or destitute of some fixable matter, which ought to be found in an healthy plant, chemical analysis may, and does, instruct the farmer how to apply the substance required in the form of artificial manures.

It has been wisely and strenuously insisted on by some recent writers, that we of England neglect our own resources: thus as respects night-soil, the Chinese (with whom it is devoutly to be hoped we may maintain friendly intercourse), might hereon instruct the best of us; and our neighbours the French and Belgians do present examples which are worthy of inspection and improvement. Liebig has written on the subject, though he says that, owing to mismanagement in France, above one half of the fertilizing powers of night-soil are lost to the land.

From a recent article on the economy of France, the following passage is extracted, as containing truths of grave moment:—"Seeing how such sources of civic and national wealth are turned to immediate account abroad, well may the sage of Giessen (Liebig) hold up his hands at the marvellous folly of the Londoners, while throwing the elements of reproduction arising from the consumption of two millions of souls (the population of a kingdom pent up in a few miles' space!) to be *carried first to the river*, and afterwards dissipated irrecoverably in the unreturning ocean; while at the same time we are fetching shipfuls of expensive *guano* from the far distant shores of America towards the Pacific Ocean."

Here we perceive a biting sarcasm upon our own profligate waste of that great fertilizer, which a rapidly-increasing and already dense population could abundantly supply. We do indeed "pay dearly for our whistle."

Liebig teaches (p. 179–80), in his comparison of manures, that "The excrements of cows, black cattle, and sheep, contain *phosphate of lime*, common salt, and silicate of lime, the weight of which varies from 9 to 28 per cent., according to the fodder which the animal receives; the fresh excrements of the cow contain from 86 to 90 per cent. of water."

"Human fœces have been subjected to an exact analysis by Berzelius. When fresh, they contain, besides ¾ their weight of water, nitrogen in very variable quantity, namely, in the minimum 1½, in the maximum 5 per cent. In all cases, however, they are richer in this element than the excrements of other animals. Berzelius obtained by incineration of 100 parts of dried excrements, 15 parts of ashes, which were principally composed of the *phosphates of lime and magnesia*."

A circumstance came under personal observation, which will immediately prove the applicability of solid and liquid human ordures to the purposes of vegetable nutriment.

In the year 1836, an excavation was made in a field at a corner remote from the dwelling, so deep, as to remove all the good earth, and to reach the hard binding subsoil; the pit was 6 or 7 feet long, 5 wide, and about 3 deep. In it were deposited the contents of a privy, and these were covered with the earth that had previously been digged out. A mound was thus raised, and this was soon planted with the Jerusalem artichoke *(Helianthus tuberosus.)* The soil was so deep, that the spade made no near approach to the manure, either in planting or digging up the tubers yearly; and the practice was continued till November last, when the pit was again prepared as in 1836. It was then seen that the night-soil had been entirely decomposed, and nearly all consumed. Of a bulk which originally comprised above 20 square feet, not more than six small barrows remained, the substance consisting of a spongy light material, replete with myriads of fibres. As a manure it was almost worthless, not a solid particle remained; for not only had the roots of the artichoke penetrated the covering earth, but the fibres of some hedge-row elms had passed under an adjoining ditch, and risen through the lower earth till they reached the manured. Here, then, was ample proof, if any had been required, of the attracting power of this strong manure, and of the decomposing energy of the vital principle of two very dissimilar species of plants.

Our writer adverts, in the next place, to *guano:* "This," he observes, "has latterly become much used as a manure, and in many instances has answered very well; yet according to the analysis of two eminent French chemists, it contains but a very minute proportion of *phosphate of lime*. Pigeons' dung is well known to be a powerful help to any crop, but night-soil is the immediate invigorator to poor land of any substance I ever yet tried; this quality, however, it does not obtain from *phosphate of lime*. Urine from cattle stalls is stated to contain only three per cent. of phosphate of lime."

These remarks, however extraneous, must be examined, because further light may thus be thrown upon the theory of manuring.

An artificial substance called *urate*, has been of late advertised. It is believed to be gypsum, saturated with urine, and therefore may be of use in lands destitute of gypsum, where saintfoin and other legumes are cultivated. The idea was evidently taken from Liebig, who announced that gypsum would fix ammonia. In localities where that earth is deficient, it may be useful to know, that it is readily prepared by sprinkling powdered chalk with diluted sulphuric acid, so long as any effervescence arise. Chalk is very cheap, and the acid diluted with eight times its weight of water, would cost a mere trifle. This sulphate of lime, when dry, may be moistened with urine from the cow stalls, and converted into an urate of the best quality.

Of *Guano*, Liebig says—"It consists of urate of ammonia and other ammoniacal salts, by the use of which a luxuriant vegetation and the richest crops are obtained." Again, in reference to night-soil, &c., he says, "The corn-fields in China receive no other manure than human excrements. But we cover our fields every year with the seeds of weeds which, from their nature and form, pass undigested along with the excrements, through animals, without being deprived of their power of germination, and yet it is considered surprising that, where they have once flourished, they cannot be expelled by all our endeavours: we think it very astonishing, while we really sow them ourselves every year. A famous botanist attached to the Dutch embassy to China, could scarcely find a single plant on the corn-fields of the Chinese, except the corn itself."

It must, we imagine, be pretty evident, from (p. 199) all that has been advanced, and many other isolated facts that we of Britain do possess, and most unjustifiably squander a store of manuring substance which contains *all* the elements of a vegetable. We find the three great elementary gases, oxygen, hydrogen, and carbon, always at hand; and in night-soil, united with lime, gypsum, alumina, ammonia, either free or combined, in the form of a neutral salt. *Farm-yard dung* need never be dispensed with, but even that is mismanaged for want of proper receptacles. But *night-soil* is forgotten or wasted, and thus the agriculturist is a loser in every way.

But to close this article appropriately, we must come back to the action of bone-dust upon the turnip-crop. Mr Prideaux had said that 1000 pounds of that material was a good allowance for an acre of land, and might raise from 25 to 30 tons of turnips. This assertion rouses our writer, and he says that 1000 pounds is less than *half a ton*, and the produce is rated at about 27 tons. "What pleasure could Mr P. have in making this statement? Is there a farmer in one hundred who will believe it? Mr Prideaux seems to suppose that bones are best adapted for turnips; but I would observe that they are equally useful in other crops. I know a small dairy-farm which, five years ago, did not produce a sufficiency of grass in summer for seven cows; but within the last eighteen months the occupier of that farm informed me that he had then twenty-three cows, and abundance of pasture for them. All this had been done by bone-dust." The letter concludes with the following remarks on *phosphate of lime*:—"This can be obtained sufficiently pure for practical purposes, by submitting a bone to the action of fire until it will break down to a fine powder. Take some of this powder, apply it to a patch of grass, land, or indeed any crop; make another trial with the soluble parts of an equal weight of unburnt bones, properly diluted with water, and cover with it another like piece of land, and it will soon be determined whether the most fertilizing properties of bone-dust are its *phosphates*, or the more easily decomposable substances, namely the fat, gelatine, cartilage, &c."

A few observations are called for. If bones be merely smashed, so as to expose the pith or marrow, and then buried, as they frequently are, about the roots of a vine, they may be traced, after the course of many years, by digging, in appearance little altered in shape or texture. Now, it should seem that the substance of the bone remaining quite sound, little of the phosphate could have been removed; and so far we may question the accuracy of the theory which ascribes all the virtue of bone-manure to the insoluble phosphates. But the question occurs—do any plants—does the turnip really contain phosphate of lime? Do its ashes, after incineration, exhibit a certain quantity of that substance? Again, let the fact be assumed that 27 tons of turnips yield 500 pounds of phosphate of lime, then what would be the inference? Why, that the phosphate of lime contained in the 1000 lb. of bone-dust, was required and taken up by the crop of turnips, and thus converted to vegetable assimilation.

We want facts, scientific experiments, and sound deductions, but the above is the way in which we ought to reason. In lieu of it a position is assumed, a dogma laid down, and every result strains to meet the theory.

Every thing seems to shew that *bones*, if used at all, ought never to be boiled or heated, but be ground finely in a bone-mill after being merely dried in heaps. Nature will select its appropriate aliment, and reject that which each individual cannot assimilate. Until societies, influential bodies, shall arise and carry through a series of experimental analysis, we ought to mix together all our manuring substances which are proved by experience to be innoxious; thus, farm-yard dung, old night-soil, bone-dust, and coal-soot, might always be blended in the dunghill, for these contain every element of vegetable organization. We dare not say the same of lime from the gas-works, nitrate of soda, potassa, or common salt; because a mistake might lead to serious injury. Saline applications should be made with extreme caution, in limited quantities; and, like cow-wash and other urinous liquid manures, be rather thrown over the weedy fallows than upon growing crops.

A free and impartial spirit of investigation is the great desideratum, while, on the other hand, a one-sided view of any subject is to be deprecated as inimical to the cause of science.

Surveying, Levelling, and Railway Engineering.[*]—In order to survey an extensive tract of country with sufficient precision, the more important points ought to be connected trigonometrically, so that the intermediate topographical details may be circumscribed within the proper limits.

The observations made to accomplish the first object require the use of the best instruments, and the computations demand the greatest nicety, otherwise the results are totally unworthy of confidence in the present state of the art. When the extreme boundaries are thus accurately fixed, the inferior subdivisions are filled up with sufficient exactness by the ordinary land-surveying theodolite and chain, because each large geodetical triangle serves to check the small inaccuracies to which these more common instruments are liable. This mode of proceeding has been well exemplified in the Ordnance Survey of Ireland, under the direction of Colonel Colby. By the aid of this survey several railways have been projected, and other improvements planned and executed, which have been of great advantage to the country.

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[*] Trigonometrical Surveying, Levelling, and Railway Engineering. By William Galbraith, M.A., F.R.A.S. William Blackwood and Sons.

It is to be hoped that Scotland, in a few years, will be enabled to draw the same benefits from the same source. For this purpose, the calculations required ought to be performed with ease, and possess at the same time the necessary accuracy. By means of new and original auxiliary tables, the author of this work has accomplished both these ends.

Several of these tables, no doubt, are common to the author and other writers. We may remark, however, that, among other *new tables*, two in particular will be found of vast importance in giving accuracy and facility to geodetical computations. These are Table XI., containing logarithms to compute the coefficient of terrestrial refraction ; and Table XIX., to convert feet on the surface of the terrestrial spheroid into seconds of arc, and conversely.

No table equivalent to Table XI.* has, to our knowledge, hitherto appeared, though formulæ have been given by some continental mathematicians, which are so complex, that they can hardly be applied by ordinary practical men, while, at the same time, their results are less accurate than those of our author. Viewed in a certain aspect, one of these formulæ entirely fails in the requisite accuracy. Indeed, in some extensive national surveys, a mean or estimated coefficient of refraction has been very generally employed, which frequently does not give heights correctly. With regard to Table XIX.

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* Our author's investigations, on which the calculation of this table is founded, are given in the Transactions of the Royal Scottish Society of Arts, vol. ii., page 26, &c.

it is computed entirely on correct principles, of which we have seen a small portion, depending upon slightly different data, extending from 50° to 60° of latitude, having the logarithms M and P computed correctly, but the whole intermediate part filled in by even proportion!

This table is of great value in determining latitudes, longitudes, and azimuths geodetically.*

Besides those already mentioned, Tables XVII., XVIII., XX., XXI., XXII., XXIII., XXIV., &c., have been either extended, improved, or computed, for the first time. All these must be of great value to both geodetical and marine surveyors.

For these reasons, we conceive that we are justified in recommending the work strongly to those surveyors who are employed in extensive portions of country, requiring the employment of the higher departments of trigonometrical surveying and levelling for their basis.

The portion devoted to railway engineering may be advantageously consulted by those projectors of railways who have an intention to give the original shareholders any thing like a fair return for their capital beyond mere promises. The extravagant lines now constructing or lately completed, it is probable, according to our author's views, will never give any thing more than an insignificant, or, at least, a *very inadequate per-centage* for the capital expended.

MISCELLANEOUS NOTICES.

I. ***Statistics of New York City.***—The following ably condensed statistical tables will be read with considerable interest. We take it from the *New York Herald*:—

We have compiled and condensed with very great labour and care from about 540 large folio pages of the deputy-marshal's returns, the following valuable and accurate statistics of this city:—

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* We have seen a work on Practical Geodesy, lately published, without giving the means of fixing points in regard to latitude, longitude, and bearing, the only facts that can, with propriety, give a just title to the name.

MINING.

	Blast furnaces.	Value produced.	Tons fuel consumed.	Persons employed.	Capital invested.
		dolls.			dolls.
Iron, ...	4	91,800	250	56	23,000
Granite, marble, &c.		140,000		121	60,000
Total in mines, .		231,800		177	83,000

AGRICULTURE.

LIVE STOCK.		BUSHELLS OF GRAIN.	
Horses, Mules, &c. . .	8477	Oats, ...	1105
Neat Cattle, . . .	3371	Buckwheat, ...	50
Sheep, ...	282	Corn, ...	2525
Swine	14,028	Potatoes, ...	18,585
Value of Poultry, .	3,150 dols.	Tons Hay, ...	747

HORTICULTURE.

	Value produced.	Persons employed.	Capital invested.
	dolls.		dolls.
Market gardens, ...	66,648	28	17,850
Nurseries, ...	24,659	22	8,500
Orchard, ...	800	2	150
Dairy, ...	25,100	9	3,600
Forest, ...	230,000	212	34,000
	347,190	329	64,000

COMMERCE.

	Number.	Persons employed.	Capital invested.
			dolls.
Commercial houses in foreign trade,	427	5380	45,970,200
Commission, ...	918		
Retail dry goods, groceries, and other stores, ...	2905	9748	13,128,740
Lumber yards and trade, ...	79	2603	905,500
Internal transportation, ...	...	328	661,980
Butchers, packers, &c.	...	483	
Total in Commerce, . .	4329	18,542	60,666,420

MANUFACTURES.

	Number of Manufactories.	Number of Persons employed.	Value produced.	Capital invested.
			dolls.	dolls.
Machinery	...	905	842,000	...
Hardware, cutlery, &c.	...	128	161,900	...
Precious metals	...	494	890,560	...
Various metals	...	848	1.130,800	...
Granite, marble, &c.	...	326	265,350	...
Bricks, lime, &c.	...	29	15,000	...
		2730	3,305,610	1,483,500
Woollen	...	248	96,500	20,000
Cotton	18	290	150,700	61,300
Silk	...	2	150	50
Mixed manufactures	...	1754	1,284,700	558,050
Tobacco	...	212	194,750	56,705
Hats and caps	...	1362	1,036,186	445,390
Straw bonnets	...		128,200	
Tanneries	1	5	175,000	20,000
Other manufactories of leather, saddleries, &c.	328	896	1,517,756	536,030
Soap and candles	...	229	926,929	277,600
Breweries	16	281	1,456,000	581,076
Distilleries	12			
Drugs, medicines, paints, dyes, &c.	...	347	2,595,010	1,061,521
Glass-houses	1	41	145,500	33,171
Glass cutting establishments	3			
Potteries	1	12	14,000	3,000
Sugar refineries	7	329	405,000	426,206
——— confectionary made	...		119,892	
Paper	3	51	65,137	27,900
Printing-offices	113	2030	2,780,000	1,285,321
Binderies	39			
Rope-walks	6	61	24,500	9,800
Musical instruments	...	281	353,530	337,700
Carriages and waggons	...	285	210,874	87,150
Grist mills	1	108	346,000	190,600
Planing mills	4			
Saw mills	9			
Furniture	...	869	1,050,275	451,300
Houses built of stone or brick	557	3969	1,813,460	675,000
Houses built of wood	55			
All other manufactories not before enumerated	...	6185	6,406,870	2,194,757
		21,577	26,602,538	10,823,037

RECAPITULATION.

	Men employed.	Value produced.	Capital invested.
		dolls.	dolls.
Manufactures	21,577	26,602,538	10,825,037
Commerce	18,542	...	60,666,420
Mining, &c.	177	231,800	83,000
Horticulture, &c.	329	347,190	64,000
	40,625	27,241,528	71,636,457

In addition to the above, the following interesting facts have been elicited by the recent census of the city:—

15 public schools in the city.
47 primary schools for children between four and seven years of age.
1 omnibus proprietor in the 11th ward employing 25 men, and a capital of 25,000 dolls.
6 livery and stage stables in the 15th ward, employing 92 men, and a capital of 58,000 dolls.
3 coal yards in the 15th ward, employing 16 men, and a capital of 35,000 dolls.
2 marble yards in the 15th ward, employing 19 men, and a capital of 18,000 dolls.
1 gas light company in the 15th ward, employing 60 men, and a capital of 275,000 dolls.
2 banks in the 2d ward, the Chemical and Fulton, with a joint capital of 100,000 dolls.
40 cords of wood cut in the city annually.
25,100 dolls. produced annually by dairies in the city.
800 dolls. produced annually by orchards in the city.
23,000 barrels of tar, pitch, turpentine, &c., made annually in the city.
1462 small arms made in the city annually.
20 men employed in making them.
2 cotton dying and printing establishments in the city.
20 pounds of silk reeled in a year.
2000 sides sole leather tanned annually in the city.
3500 do. upper do. do. do.
9,313,700 pounds of soap made do. do.
2,353,400 do. of tallow candles made annually in the city.
250,000 do. of sperm and wax do. do.
2,992,278 gallons of spirits distilled do. do.
1,295,490 do. of beer brewed do. do.
17 daily newspapers printed in the city.
38 weekly do. do. do.
9 semi and tri-weekly do. do.
33 periodicals do. do.

In the above statistics, there is not full mention made of the omnibus proprietors. The deputy-marshal of the 11th ward returns one of these as employing 25 men, and a capital of 25,000 dollars. None of the other marshals have thought proper to say a syllable on the subject, because the law does not compel them. None of these marshals have returned a single dollar under the head of "Value of ships and vessels built," although required by law to do so. In the 16th ward, near the foot of the 17th street, there is one ship-building yard; in the 7th ward there are two, viz. Christian Bergh's, foot of Scammel Street, and Westervelt's, at the extreme end of Cherry Street. The remainder are in the 11th and 13th wards. These are owned by Brown and Bell, Webb and Allan, William H. Brown, Jabez Williams, Pickett and Thomas, Bishop and Simonson, Lawrence and Sneeding, Smith and Deming.

Under the head of "Printing and Binding," the marshals of the 3d and 4th ward committed some egregious blunders, which we have since corrected by personal inquiry. Instead of returning the number of different daily and weekly newspapers and periodicals printed in their wards, they returned the total number of sheets struck off. All the others were correct. Of iron founderies we only find one returned in the 11th, and two in the 6th ward. We do not find any return made of the steam grist-mill in the 13th ward, nor of Bilby's mill for hulling rice, &c., in the 7th ward. The shot tower is not included in any return.

II. *New South Wales.*—The rise and progress of the colony of New South Wales have, from the time when they first attracted our special attention, filled, and continue to fill, our minds with astonishment. Recollect, as we cannot too often repeat, that less than sixty years since, it was decided by the most competent judges, that the establishment of a colony there was impracticable—wholly impracticable; and then take the following as the latest statistical returns from it.

In the month of March, the number of vessels which left Sydney on the *coasting* trade for the different ports of the colony were ninety-nine, comprising three thousand one hundred and fifteen tons; and during the same period, no fewer cleared out than ninety-six vessels; making an amount of two thousand four hundred and forty-three tons. Besides, there are seven steam-vessels, averaging two trips per week to Hunter's River, Port Macquarrie, Brisbane Water, and Woologony.

During the same month of March, twenty-four ships arrived at Sidney—eight from London, three from America, five from Port-Philip, three from Liverpool, three from the Bay of Islands, one from Calcutta, and one from a whaling voyage; which, together with fourteen brigs from different parts of the world, and eight schooners, make forty-seven vessels in thirty-one days.

Now, let us look at a summary of the exports and imports of this marvellous colony for the last ten years—the progress has been as follows:—

IMPORTS.

From Great Britain,	In 1830,	L.268,935
	In 1835,	707,133
	In 1840,	1,071,167

Thus we have, in the first five years, an increase of imports from the mother country direct, of more than 162 per cent.; in the second five years, of more than 178 per cent.; and in the whole ten years, of more than 632 per cent.

From British Colonies,	In 1830,	L.60,366
	In 1835,	144,824
	In 1840,	195,722
From Foreign States,	In 1830,	91,189
	In 1835,	70,161
	In 1840,	250,383

Our trade with the United States of America exhibits a very gratifying increase. The imports were—

In 1835,	L.13,902
In 1840,	24,164

being nearly double; but so rapidly are our commercial relations with brother Jonathan extending, that we should think the imports from America during the first three months of the present year will have nearly equalled those of the previous twelve months.

The total of our imports were—

In 1830,	L.420,485
In 1835,	1,114,800
In 1840,	2,600,650

This shews an increase, in the first five years, of more than 165 per cent.; in the second five years, of more than 133 per cent.; and in the whole ten years, of more than 518 per cent.

Such were our imports, or the *debit* side of our trade account; let us now look at the exports or *credit* side. These were—

To Great Britain,	In 1830,	L.120,599
	In 1835,	496,345
	In 1840,	1,469,607

This is a truly cheering result, the increase of our exports to the mother country direct, being in the first five years more than 310 per cent.; in the second five years more than 196 per cent; and in the whole ten years upwards of 1210 per cent.

To British Colonies,	In 1830,	L.15,597
	In 1835,	88,108
	In 1840,	236,625
To Foreign States,	In 1830,	23,503
	In 1835,	3,011
	In 1840,	24,014

The returns under the head of Foreign States, do not include the exports to the United States of America, which were—

In 1835,	L18,594
In 1840,	27,885

Being an increase, in five years, of more than 49 per cent.

The *totals* of our exports were—

In 1830,	L.159,659
In 1835,	682,193
In 1840,	2,007,992

The increase is here highly flattering in the first five years, more than 327 per cent.; in the second five years more than 194 per cent.; and in the whole ten years *upwards of* 1257 *per cent.!—John Bull.*

III. *Revenues of England and France.*—The following comparative Table of the revenues of England and France for the year just expired is given by the *Quotidienne.* It is obtained for the former country from the official published returns, and for the latter from the budget of 1840. The sums are in francs :—

	England.	France.
Customs,	493,858,500	168,195,000
Stamps of all kinds,	165,897,550	225,150,200
Excise in direct taxes,	314,384,300	230,720,000
Direct and assessed taxes,	98,661,100	392,764,951
Post-Office,	11,025,000	45,188,000
Crown lands,	4,187,500	—
Public instruction,	—	4,165,500
Various products,	1,942,900	11,398,990
Loans and repayments,	26,113,400	—
Extraordinary means,	—	57,255,292
Woods and fisheries,	—	34,577,632
Total,	1,118,660,000	1,184,523,365

IV. *Statistics of Naples.*—The Neapolitan Minister of Police has just published a return of the movement, in 1839, of the population of the continental territory of the kingdom of the Two Sicilies, or of Naples, properly speaking. The population augmented during that year by 39,194 individuals, and on the 1st of January 1840, it consisted of 6,133,259 souls, viz. 3,009,008 males, and 3,104,251 females. The births amounted to 226,087, viz. 116,142 boys, and 109,945 girls; and the deaths to 186,893, viz. 96,273 men, and 90,620 women. Among the latter were 37 persons upwards of 100 years of age, 15 men and 22 women. On the 1st of January 1840, there were in the kingdom of Naples 29,783 secular clergymen, 12,741 monks, 10,449 nuns, 25,572 civil and military officers, 5981 persons engaged in public instruction, 7920 lawyers, 15,906 physicians, 12,666 merchants, 13,476 artists, 536,320 artisans, 1,823,080 agriculturists, 70,970 shepherds, and 31,190 seamen.

V. *Balloons.*—The march of intellect, or perhaps we should rather say the application of the rapidly-increasing scientific knowledge of our contemporaries, promises wonders. It seems that simultaneously in France and America the reduction to a certainty of guiding balloons has attracted the attention of projectors, and that in one case at least the hitherto unattainable power of guiding these machines has been achieved.

From America we have the following calculated table, which is exceedingly striking :—

" We are indebted to our namesake, James Bennett, Esq., of Arlington House, Long Island, for the following curious calculations of the ascentive power of balloons. We think there can be no doubt that the science of aërial navigation will, before long, take the place of nautical science, and that crossing the ocean in three days will be thought a feat no greater than that performed every sixteen days by our steam-packets. There are great events a-head. The balloon in the table of 1000 feet in diameter, would carry off every man, woman, child, dog, and cat in New York city.

ASCENDING POWER OF BALLOONS, &C.

Diameter in feet.	Ascentive power in pounds.	Square yards of cloth to make each.	No. of men equal in weight at 150 lbs. each or No. of horse power.	Weight of Russia drilling cover.		Weight of cover made of copper.	Absolute power above copper cover.†
				Drilling.	Power above cover.		
				lb.	lb.	lbs.	lbs.
10	31	85		15	16		
20	250	140	1⅓	100	150		
30	843	314	5 1-5	300	543		
35	1,684	428	11	400	1,284		
40	2,000	858	16	500	1,500 5 lb. of copper to square yard.		
50	3,906	862	26	812	3,094		
60	6,750	1.256	45	1,200	5,550	6,280	470
70	10.719	1,710	71	1,680	9.039	8,550	2.169
80	16,000	2.234	107	2,170	13,830	10,100	5,830
90	22,780	2,827	152	2,714	20,066	14,130	8,646
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
						6 lb. to sq. yd.	
100	15½	3,491	206	1¾	13½	10½	5
200	125	13.962	1,666	7	118	42	83
300	422	31,416	5,620	15¾	406	106	318
						10 lb. to sq. yd.	
400	1,000	55.855	13.333	28	972	280	920
500	1,953	87,267	26,040	43¾	1,909	486	1,517
600	3,375	125,664	45,013	63	3,312	630	2,745
700	5,360	171,048	71,466	85½	5,274	885	4,475
800	8,000	223.403	106,666	111½	7,888	1,115	6,885
900	11,390	282.744	151,867	141½	14,148	1,413	9,977
1000	*15,625	349,067	208,000	174½	15,450	1.745	18,880

* The second column shews the power of the gas only.

† Copper, sheet iron, or tin will answer.

"This table was calculated on the 21st December 1840, at Arlington House, L. I., New York, by James Bennett."

This table, however, refers merely to the ascending power, and although it proves to demonstration the certainty of possessing *that*, it is the following paragraph from the French papers which leads us to believe that the force to be so obtained may be serviceably applied :—

"An experiment of the highest interest was performed on Monday at the Chateau de Vilictaneuse, near St Denis. M. S—— and his son had for some time past announced publicly that they had succeeded in the means of directing balloons in the air, and several experiments on a small scale in the courtyard of the Ecole Militaire, in Paris, had been attended with satisfactory results. The experiment of Monday has verified all their hopes. M. S. jun., after rising to a height of about 250 metres with a balloon constructed by himself and his father, set at work their ingenious mechanism, and immediately the balloon proceeded to the west, notwithstanding a pretty strong wind blowing from that point. He then returned and sailed about in various directions, the balloon rising or lowering at the will of the aeronaut without the apparent use of any kind of ballast. The experiments lasted for three hours, at the expiration of which time M. S. descended at the point from which he had started, amidst the acclamations of the spectators."

What to us has always appeared the insuperable objection to the success of any attempt to steer balloons, is the want of resistance in the element through which they are to be navigated. If this statement is to be credited, that difficulty has been surmounted; and really, when we recollect that if our fathers in their youth had been told that the Atlantic was to be crossed in fourteen or fifteen days, and that a man might dine one day in Dublin and the next in London, they would have been quite as well disposed to laugh at the idea, as sceptics may, at the present moment, feel inclined to doubt the practicability of aerial navigation.—*John Bull.*

VI. *Flexible Ivory.*—It has been long known that in subjecting bones to the action of hydrochloric acid, the phosphate of lime which forms one of their component parts, is extracted. Bones preserved in this manner retain their original form and acquire great flexibility. It is by this process that M. Charriere, a skilful maker of surgical instruments in Paris, softens the ivory of which he makes use to manufacture flexible tubes, probes, and other instruments. These pieces, after receiving the required form and polish, are steeped either entirely or partially in acid diluted with water, where they remain as long as required. The ivory, after having undergone this preparation, becomes supple, flexible, elastic, and assumes rather a yellowish colour. In the course of drying it again becomes hard and inflexible; but the flexibility of the ivory may be restored by wetting, either by surrounding it with a piece of wet linen, or by placing sponge in the cavities of the pieces. Some pieces of ivory have been kept in a flexible state in the acidulated water for eight days; they were neither changed nor injured, nor too much softened; they had acquired no taste nor any disagreeable smell. With respect to the excellence of the articles thus manufactured by M. Charriere, it may be observed that they have been examined by competent judges, and approved by the Royal Academy of Medicine. The preparation of flexible ivory may give rise to various useful applications of it in the arts or manufactures.

VII. *A Means of destroying Insects.*—Our correspondent, Mr Pearson, speaking of destroying insects in fruit and forest trees, suggests "that some good might be done by lighting fires of the brushwood usually left to rot in woods. As light attracts the winged insects, they would fly into the fires by thousands, and this at a time when they are about depositing their eggs." The idea is excellent, and has already, as some of our readers are aware, been carried into execution by M. Audouin, in the vineyards of France, by the use of lamps, as being more economical and effective than fires of brushwood. M. Audouin founded his mode on the practice of lighting fires during the night in vineyards, to which the moths are attracted, and burn themselves. He modified this practice in a very ingenious manner, and it has been attended with the most effective results. He places a flat vessel with a light on the ground, and covers it with a bell-glass besmeared with oil. The pyralis (the insect most destructive to the vines in France), attracted by the light, flies towards it, and, in the midst of the circle which it describes in flying round the light, it is caught and retained by the glutinous sides of the bell-glass, where it instantly perishes by suffocation Two hundred of these lights were established in a part of the vineyard of M. Delahante, of about four acres in extent, and they were placed about 25 feet from each other. The fires lasted about two hours: and scarcely had they been lighted, when a great number of moths came flying around, which were speedily destroyed by the oil. The next day the deaths were counted; each of the 200 vessels contained, on an average, 150 moths; this sum multiplied by the first number, gives a total of 30,000 moths destroyed. Of these 30,000 insects, we may reckon one-fifth females, having the abdomen full of eggs, which would speedily have laid, on an average, 150 eggs each. This last number multiplied by the fifth of 30,000, that is to say, by 6000, would give for the final result of this first destruction, the sum of 900,000. On the 7th of August 180 lamps were lighted in the same place, each of which, on an average, destroyed 80 moths, or a total of 14,400. In these 14,400 moths, there was reckoned to be not only one-sixth, but three-fourths females; or 7200, and multiplying this by 150 (the number of eggs that each would have laid), we have a total of 1,080,000 eggs destroyed. Two other experiments were made on the 8th and 10th of August, which caused the destruction of 9260.—*Gardeners' Gazette.*

QUARTERLY AGRICULTURAL REPORT.

February 1843.

We have had very few topics in the last quarter which offer subjects for remark. To compose a few paragraphs, therefore, we must look to another quarter, and there is always that fruitful fund of remark in the country to draw upon—the weather. Upon the whole, it has been very mild, not disagreeably warm for the season, nor thick and close, a state which the air frequently assumes in fresh weather in winter, but rather of an exhiliarating character, with clear sky, frequent sunshine, and pleasant breezes. The usual hybernal atmospheric accompaniments, however, have not been altogether awanting. Pretty severe frost, and some snow, particularly on the hills, made a rather angry appearance about the beginning of the new year, but they passed away without much rain, and mildness again presented its placid countenance, and induced, by its presence, the early spring-flowers to take a peep of what was going on in the vegetable world around them. It is seldom that the spring crocus appears so early as January, as it did this year. Besides a few pinches of frost, we have had some severe blows of wind. The barometer suddenly sunk in the end of January an inch and a-half below its usual level, without any adequate cause presenting itself to our view, but a great change in the atmosphere had undoubtedly been effected somewhere, and accordingly in the course of a week we heard of hurricanes of the most violent description on the north coast of France, and of the most appalling shipwrecks, almost without number. Again, frost of the intensest character has appeared, the thermometer going so low as 21° in the night, and reaching no higher than the freezing point during the day. Sill there is no appearance of a storm, or of any great deposition of moisture from the atmosphere. The earth has been so unusually warmed in the winter, that little probability now exists of snow lying for a long time at this advanced period of the year.

As might have been expected, the autumnal wheat, of which a large breadth was sown, where it was early sown, and we cannot help thinking that, in the strong clay soils, it is commonly too early sown in autumn, advanced so rapidly as to become what is termed *proud*, in which state it is very apt to be rotted from the ground, when covered for a time with heavy snow, or to be much cut down by black frost; but hitherto, proud as it is, it has escaped harm, though its colour has been somewhat affected. The same benign atmospherical influences encouraged the turnip bulb to shoot into the flower-stem. The Swedes, however, have grown all winter, and the vital principle having been kept in action, they have exhibited feeding properties beyond what was anticipated of them after the mildew, and when stock were put up to feed at the commencement of winter. One benefit already derived from the mild weather, through the instrumentality of the turnip, is the improved quality of the meat exhibited in the shops, which is now equal to that of last year, though the carcasses do not present the same weights. The young grass looks well, and the irrigated meadows in the neighbourhood of Edinburgh could already almost be cut with the scythe.

Field labour, experiencing but little interruption, is now unusually far advanced, and we believe that the land is now fully prepared for the seed, come the time for its distribution when it may.

The price of meat has fallen, though not yet below what good meat should be sold for. Cattle, it is feared, will leave but little profit from feeding this season, having been bought in high before the prices had reached their minimum. Every fact tends to show that the depression experienced in the price of stock has not yet, at least, been caused by the actual competition with foreign cattle, now allowed to be imported by the new tariff. At the date of our last report in November, the number of head of cattle then imported was 2092, and on the authority of the Earl of Ripon in Parliament, the other day, the number is now 3126, so that 1034 head of cattle, and 315 pigs, have only found their way into the country in the course of the last quarter; still the *fear* of competition, occasioned by importation, will no doubt *prevent* the price of meat *rising beyond a certain mark,* but what that mark will exactly attain to, we do not pretend to foretel. But we express it as our opinion, that if this fear have the effect of making the breeders of stock, in pastoral districts, maintain their full number of stock, in proportion to the ability of the pasture to support them, and oblige them to abandon the system which stints breeding with the view of obtaining high prices, the tariff will confer a vast advantage on themselves, as well as on the country. So long as stock-breeders were independent of competition, it was certainly in their power to affect the prices of stock, because the practice was, and still is, that when prices become low, breeding was stinted, and breeding was only allowed to take its *natural* course when prices became high. The obvious effect of such a system was first to lessen, and then to increase the number of stock. When the number was low, the condition was good, both of which circumstances gave an impulse to price. Then high prices tempted breeding, and any sort of animal was bred, thereby *overstocking* the pasture, suppressing condition, and of course depressing prices. This see-saw was carried on every few years, but no mode of farming could be more unsafe for the breeder, as it engendered in him the feelings of a speculator, which urged him to its continuance in the spirit of a gamester—trying another throw for better luck. It is clear that the farmer's *safe* practice is to *stock,* but *not to overstock* his ground, because then his stock will always be in good condition, and their number every year invariable, and being so, at least as much so as circumstances attendant on weather will allow, he will ascertain his means much more satisfactorily, under steadiness of prices, than when pursuing a system founded on speculation on prices.

Were markets steadily supplied with meat, from a sensible system of breeding, the prices might not perhaps be always steady; because the steady system would improve the pasture, and raise additional meat; and the additional meat would tend to depress prices gradually, but the breeder would have more beasts, and more meat to dispose of, and always riper for the market than before, and rent would then accommodate itself to the steady state of things. We have had sufficient experience since the date of the last war, to let us see that breeders of stock have not proceeded on this judicious system, but rather in the *speculative spirit* of breeding for high prices. Many men who farmed land were embued with this spirit during the war who knew nothing of farming, and the virus which they left behind them has not yet been purged from the system. We again repeat, that if the new tariff, by *permitting competition* in our own markets, *puts a stop to the possibility* of *breeding for high instead of steady prices,* it will be of much service to this country. It is possible to attain steadiness in the price of stock, for the stock-farmer is not so dependent on the weather for the *number* as the *condition* of his stock.

This reasoning, however, does not apply to the management pursued by our *corn*-farmers; because, following a regular rotation of cropping, which they would as soon lose their character for good farming, as violate in a single condition, it is not in their power to stint the productions which they raise, its scarcity and prolificacy being entirely dependent on the state of the weather. To subject corn-farmers, therefore, to uncontrolled competition, would be as unfair, as on finding a man fettered, to desire him to use means to defend himself against the unconstrained attack of his foes, instead of assisting him.

We have hitherto refrained from noticing the doings of the Anti-Corn-Law League, as they style themselves, because, whenever they assumed political agitation as the weapons of their warfare, we conceived that they retired into an arena into which we had no right to follow them; but as they have lately thought proper to send us a large bundle of the papers, which they are using extraordinary means to circulate through the country, we may express it as our opinion, that if they have no more powerful arguments to adduce than what are contained in their prize essays, upon which they have lavished premiums raised in contributions from soft people, they have not much to say for themselves, for these productions are really below criticism; not one word of *common sense* being in them all, but mere declamation on, and assumptions of, the very points which it was their duty to prove.

THE REVENUE.

***ABSTRACT** of the Nett Produce of the Revenue of Great Britain, in the Quarters and Years ended on the 5th of January 1842, and 5th of January 1843—shewing the Increase and Decrease on each head thereof.*

	Quarters ended January 5.		Increase.	Decrease.	Years ended January 5.		Increase.	Decrease
	1842.	1843.			1842.	1843.		
	£	£	£	£	£	£	£	£
Customs, ...	4,795,274	4,214,089	. .	581,185	19,899,585	19,075,310	. .	824,275
Excise, ...	3,789,270	3,072,008	. .	717,262	12,580,918	11,407,304	. .	1,173,614
Stamps, ...	1,618,517	1,561,754	. .	56,763	6,709,446	6,491,100	. .	218,346
Taxes, ...	1,910,010	1,886,163	. .	23,847	4,482,911	4,273,592	. .	209,319
Post-Office, . .	127,000	141,000	14,000	. .	455,000	605,000	150,000	. .
Miscellaneous,	64,052	61,537	. .	2,515	259,738	712,411	452,673	. .
Property Tax,	. .	257,212	257,212	. .	. .	571,056	571,056	. .
			271,212	1,381,572			1,173,729	2,425,554
	Deduct Increase,			271,212	Deduct Increase,			1,173,729
	Decrease on the Qr.			1,110,360	Decrease on the Yr.			1,251,825

TABLES OF PRICES, &c.

The Average Prices of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets:—

LONDON.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1842.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Nov. 5.	52 0	30 8	17 1	31 9	33 6	30 11
12.	52 8	31 2	17 6	32 8	33 4	30 8
19.	53 4	31 1	17 10	31 6	34 1	31 8
26	53 7	30 11	17 6	32 1	33 7	31 7
Dec. 3.	52 9	31 2	18 4	30 8	33 9	31 0
10.	51 2	29 6	17 3	28 6	32 8	30 2
17.	51 0	28 8	17 4	29 4	31 6	30 6
24.	50 8	28 9	17 11	28 8	31 0	29 9
31.	50 5	28 3	17 11	28 4	30 4	29 2
1843.						
Jan. 7.	50 8	28 8	18 0	28 10	29 8	28 7
14.	51 6	27 9	17 11	31 2	29 6	28 2
21.	52 3	29 3	17 10	29 8	29 10	29 6
28.	53 8	31 2	17 10	30 2	30 6	29 1

DUBLIN.

Date.	Wheat per Bar. 20 St.	Barley per Bar. 16 St.	Bear per Bar. 17 St.	Oats per Bar. 14 St.	Flour per Bar 9 St
1842.	s. d.	s. d.	s. d.	s. d.	s. d
Nov. 4.	25 4	12 0	10 8	8 9	15 11
11.	24 7	12 2	10 10	9 0	16 2
18.	25 11	12 4	11 0	9 2	16 4
25.	25 9	11 10	10 2	9 1	16 3
Dec. 2.	25 1	10 6	10 4	8 11	16 0
9.	25 4	12 6	9 10	8 10	15 10
16.	26 0	12 8	10 4	8 9	16 0
23.	26 4	11 10	9 8	8 8	15 11
30.	26 1	12 1	10 2	8 9	15 11
1843.					
Jan. 6.	26 3	11 5	10 4	8 5	15 4
13.	26 1	11 8	11 0	8 6	15 9
20.	27 9	13 8	11 7	9 0	16 2
27.	27 8	12 10	11 4	9 4	16 6

LIVERPOOL.

Date.	Wheat.	Barley	Oats.	Rye.	Pease.	Beans.
1842.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Nov. 5.	46 3	29 9	17 8	30 8	32 6	32 11
12.	47 2	27 3	17 2	31 4	33 2	34 9
19.	45 10	29 3	17 4	31 7	33 8	33 0
26.	46 6	27 6	17 6	32 1	33 10	31 1
Dec. 3.	45 3	27 8	16 8	31 4	33 6	31 6
10.	44 3	29 1	16 9	30 8	32 4	32 1
17.	43 10	28 4	17 0	30 2	32 3	31 0
24.	45 10	27 4	16 10	29 9	31 9	33 3
31.	44 11	28 1	16 6	29 2	31 6	32 4
1843.						
Jan. 7.	44 5	29 0	17 3	29 8	31 0	30 9
14.	47 8	27 0	16 3	29 6	30 7	31 4
21.	47 10	27 5	16 8	29 10	30 6	29 5
28.	48 1	28 4	17 7	29 4	30 2	28 9

EDINBURGH.

Date.	Wheat.	Barley.	Oats.	Pease.	Beans
1842.	s. d.	s. d.	s. d.	s. d.	s. d.
Nov. 2.	51 10	29 9	19 8	33 6	34 0
9.	48 10	27 5	20 4	33 5	33 9
16.	51 6	28 9	22 8	32 0	32 6
23.	52 4	28 0	20 1	33 0	33 9
30.	49 2	27 0	19 5	32 6	33 0
Dec. 7.	49 6	26 8	18 8	31 2	31 6
14.	49 10	26 2	18 7	31 0	31 6
21.	47 9	27 0	19 9	30 6	31 0
28.	46 8	28 0	19 6	29 8	30 0
1843.					
Jan. 4.	47 4	27 5	18 11	32 0	32 5
11.	47 5	27 4	18 10	32 0	32 6
18.	47 0	27 10	19 11	31 0	31 4
25.	47 6	27 6	18 9	30 6	30 10

TABLE shewing the Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. IV. c. 58, and 5th Vict. ch. 14, and the Aggregate Averages which regulate the Duties payable on FOREIGN CORN: the Duties payable thereon, from November 1842 to February 1843.

Date.	Wheat.			Barley.			Oats.			Rye.			Pease.			Beans.		
	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.
1842.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Nov. 5.	48 7	50 9	20 0	28 2	28 7	9 0	17 5	18 2	8 0	29 10	31 1	10 6	34 4	33 9	9 6	31 11	32 6	10 6
12.	48 8	50 0	20 0	27 11	28 6	9 0	17 9	18 0	8 0	32 2	31 4	10 6	33 2	33 8	9 6	31 8	32 2	10 6
19.	48 9	49 8	20 0	28 1	28 5	9 0	17 10	17 11	8 0	31 6	21 7	10 6	34 2	33 9	9 6	31 6	31 11	10 6
26.	49 6	49 5	20 0	28 1	28 8	9 0	17 9	17 10	8 0	32 2	31 8	10 6	33 7	33 9	9 6	31 4	31 10	10 6
Dec. 3.	48 6	49 1	20 0	27 9	28 1	9 0	17 8	17 9	8 0	28 1	30 11	10 6	33 5	33 8	9 6	30 11	31 7	10 6
10.	47 3	48 8	20 0	27 1	27 10	9 0	17 8	17 7	8 0	29 5	30 7	10 6	32 3	33 6	9 6	30 3	31 3	10 6
17.	46 10	48 5	20 0	26 5	27 7	9 0	17 2	17 7	8 0	28 11	30 5	10 6	32 2	32 2	10 6	29 10	30 11	10 6
24.	47 2	48 2	20 0	26 5	27 4	9 0	17 4	17 6	8 0	28 5	29 9	11 6	31 2	32 10	10 6	28 11	30 5	10 6
31.	47 1	47 9	20 0	26 3	27 0	9 0	17 2	17 5	8 0	28 1	29 2	11 6	30 1	32 2	10 6	28 3	29 11	11 6
1843.																		
Jan. 7.	47 1	47 4	20 0	26 3	26 9	10 0	17 2	17 4	8 0	31 7	29 5	11 6	29 11	31 8	10 6	28 0	29 4	11 6
14.	47 10	47 2	20 0	26 5	26 6	10 0	16 11	17 2	8 0	29 4	29 4	11 6	29 7	31 0	10 6	27 5	28 0	11 6
21.	49 1	47 6	20 0	27 2	26 6	10 0	17 0	17 1	8 0	28 2	29 1	11 6	29 5	30 7	10 6	27 7	28 4	11 6
28.	48 3	47 11	20 0	27 8	26 9	10 0	17 0	17 2	8 0	30 4	29 4	11 6	30 0	30 3	10 6	27 10	28 0	11 6

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the Quantities of Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; the Quantities upon which duties have been paid for home-consumption, during the same Month; and the Quantities remaining in Warehouse at the close thereof, from 5th November 1842 *to 5th January* 1843.

Month ending	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN WAREHOUSE.		
	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.
Nov. 5. 1842.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, . .	91,342 3	858 2	95,200 5	2,627 7	243 2	2,871 1	148,462 4	1,025 3	149,487 7
Barley, . .	2,665 1	44 5	2,709 6	4,198 5	44 5	4,243 2	75,452 7	. .	75,452 7
Oats, . . .	9,719 2	13 5	9,732 7	873 6	13 5	887 3	78,850 1	. .	78,850 1
Rye, ...	. .	. .	. .	. .	. .	. .	1,366 6	. .	1,366 6
Pease, . . .	1,296 2	329 5	1,625 7	2 074 1	329 4	2,403 5	35 317 6	388 1	35,705 7
Beans, . .	18,135 3	. .	18,135 3	9,035 6	. .	9,035 6	79,495 2	. .	79,495 2
Totals,	126,358 3	1,246 1	127,404 4	18,810 3	631 0	19,441 1	418,945 2	1,413 4	420,358 6
Dec. 5. 1842.									
Wheat, . .	53,801 3	415 6	54,217 1	643 3	574 6	1,218 1	185,563 0	866 3	186,429 3
Barley, . .	531 2	. .	531 2	3,849 6	. .	3,849 6	69,398 5	. .	69,398 5
Oats, . . .	2,719 7	. .	2,719 7	1,308 1	. .	1,308 1	61,642 4	. .	61,642 4
Rye, ...	. .	. .	. .	. .	. .	. .	1,366 6	. .	1,366 6
Pease, . . .	1,226 3	308 0	1,534 3	2,538 6	249 4	2,788 2	33,457 0	446 5	33,903 5
Beans, . . .	8,897 0	. .	8,897 0	1,735 1	. .	1,735 1	82,770 2	. .	82,770 2
Totals,	66,175 7	723 6	67,899 5	10,075 1	824 2	10,899 3	434,198 1	1,313 0	436,511 1
Jan. 5. 1843.									
Wheat, . .	35,886 0	6,464 7	42,350 7	2,091 3	3,492 1	5,583 4	208,810 0	3,839 1	212,649 1
Barley, . .	2	. .	0 2	3,379 0	. .	3,379 0	61,785 0	. .	61,785 0
Oats, . . .	26 3	. .	26 3	501 1	. .	501 1	55,725 3	. .	55,725 3
Rye, ...	1 0	. .	1 0	1 0	. .	1 0	1,366 6	. .	1,366 6
Pease, . . .	1,042 3	759 3	1,801 6	5,813 7	760 3	6,574 2	28,789 0	446 5	29,235 5
Beans, . .	15,062 0	. .	15,062 0	3,495 6	. .	3 495 6	91,878 1	. .	91,878 1
Totals,	52,018 0	7,224 2	59,242 2	15,282 1	4,252 4	19,534 5	448,354 2	4,285 6	452,640 0
Nov. 5. 1842.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
Flour, . . .	5,189 1 8	13,627 2 22	18 817 0 2	145 2 19	8,785 3 7	8,931 1 26	33,981 2 21	12,152 0 4	46,083 2 2
Oatmeal, .	. .	101 1 20	101 1 20	. .	648 1 21	648 1 21	20 3 18	101 1 1	122 0 1
Totals,	5,189 1 8	13,729 0 14	18,918 1 22	145 2 19	9,434 1 0	9,579 3 19	33,952 2 11	12,253 1 5	46,205 3 1
Dec. 5. 1842.									
Flour, . . .	11,432 3 9	20,355 2 23	31,788 2 4	38 0 8	12,922 1 18	12,960 1 21	42,265 1 21	21,041 2 10	63,307 0
Oatmeal, .	0 0 14	583 2 16	583 3 2	0 0 14	583 3 2	583 3 2	22 1 16	101 1 1	123 2 17
Totals,	11,432 3 23	20,939 1 11	32,372 1 6	38 0 22	13,506 0 15	13,544 0 23	42,287 3 9	21,142 3 11	63,430 2 20
Jan. 5. 1843.									
Flour, . . .	11,510 3 10	65,954 2 5	77,465 1 15	263 1 23	22,251 2 24	22,515 0 19	45,030 0 0	62,990 0 27	108,020 0 2
Oatmeal, .	339 1 12	826 3 14	1,166 0 26	331 1 22	826 3 14	1,158 1 8	30 1 6	101 1 1	131 2 7
Totals,	11,840 0 22	66,781 1 19	78,631 2 13	594 3 17	23,078 2 10	23,673 1 27	45,060 1 6	63,091 2 0	108,151 3 6

PRICES of BUTCHER-MEAT.

	LONDON, *Per Stone of* 14 lb.		MORPETH, *Per Stone of* 14 lb.		EDINBURGH, *Per Stone of* 14 lb.		GLASGOW, *Per Stone of* 14 lb.	
Date.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
1842. Nov.	7/ to 7/3	7/3 to 7/9	7/ to 7/3	7/ to 7/6	7/ to 7/3	6/9 to 7/3	6/9 to 7/3	6/9 to 7/3
Dec.	7/3 7/6	7/ 7/6	7/ 7/6	7/ 7/3	7/ 7/6	6/6 7/	6/6 7/	6/6 7/3
1843. Jan.	6/9 7/6	7/3 7/6	6/9 7/3	6/9 7/	6/6 7/	6/3 7/	6/3 7/	6/3 7/

. *PRICES of English and Scotch WOOL.*

ENGLISH, per 14 lb.		
Merino, ...	14/ to	17/
in grease . . .	12/	14/
South Down, . .	12/6	15/
Half Bred, . . .	11/	13/
Leicester, Hogg . .	14/	17/
Ewe and Hogg. . .	11/6	14/
Locks, ...	5/6	7/
Moor, ...	5/	6/

SCOTCH, per 14 lb.		
Leicester, Hogg, . .	13/ to	16/3
Ewe and Hogg. . .	11/6	13/
Cheviot, white, . . .	11/	13/6
Laid, washed, . .	8/	10/
unwashed, . .	6/3	7/
Moor, white, . . .	6/	6/9
Laid, washed, . . .	5/	5/6
unwashed	4/	5/

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IN SCOTLAND,

IN

1840.

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PRELIMINARY NOTICE.

The business of The Highland and Agricultural Society of Scotland is conducted by a President, Four Vice-Presidents, Thirty Ordinary, and Ten Extraordinary Directors, a Treasurer, an Honorary Secretary, and a Secretary, to which last all communications are addressed. The Ordinary Directors are subdivided into Committees for the dispatch of business, assisted occasionally by those Ordinary Members most conversant with the subjects to be discussed. The Report of each Committee is brought before the Directors collectively for farther procedure, and their proceedings are again submitted for approbation to a half-yearly General Meeting of the Society. One of the General Meetings is, by the Charter, appointed to be holden on the second Tuesday of January; the other on such lawful day in the months of June or July as the Directors may fix. New Members are admitted at either of these General Meetings by ballot. They pay a small annual contribution of £1 : 3 : 6, or, in their option, and in full of all future claims, a life subscription of Twelve Guineas. The Annual Subscription is payable in advance, and is expected to be so paid or remitted, by the Members who are liable in it, without expense to the Society. All Meetings of Directors, or Committees, are open; and at these any member may attend and deliver his opinion on the subjects under consideration, though, in cases of division, the Directors or Members of the Committees only are entitled to vote. Members have access to the Society's Library, which is annually increasing by the purchase or donation of books connected with the purposes of the Institution.

When the Highland and Agricultural Society of Scotland was instituted in the year 1784, the object chiefly contemplated was the improvement of the Highlands, and hence the name—The Highland Society of Scotland—which it then assumed. But the great increase in the number of its Members since that time, the happy management of its funds, and the change in the general state of the country, have long enabled it to extend the design of its first institution, and direct attention to every part of North Britain where industry might be excited or the useful arts improved. In accordance with this extension of the purposes of its institution, the Society, in its Supplementary Charter, has been named The Highland and Agricultural Society of Scotland.

The Society has, neither by its Charters of Incorporation, nor by its practice, been limited in its patronage to any one department of industry; but it has regarded, as the fitting objects of encouragement, every application of useful labour which might tend to the general good. But although its patronage be thus extended as regards its objects, circumstances have arisen to modify, in some cases, the application of it. The establishment of certain Boards, for the encouragement of the Herring Fishery, and the like, has induced the Society to restrict its original views, and to devote its attention, and apply its funds, in a more special manner, to other objects, and chiefly to Agricultural and Rural Economy in their various branches.

In fulfilment of its purposes, the Society is every year accustomed to offer and award a variety of Premiums, as the means of eliciting and diffusing knowledge as incitements to industry, or as the rewards for useful undertakings. These relate to every subject which may be supposed to fall within the plan of the Institution: such are, the Improvement of Waste Lands by Tillage, by Irrigation, or by Draining, the development of the Mineral products of the country, the extension of Plantations, as the objects of ultimate profit, or of present embellishment and shelter,—the improvement of the breeds of Live Stock, and of the qualities of Wool,—the encouragement of certain domestic Manufactures, and not the least in interest and importance, the awakening the industry of the Lower Ranks to such pursuits as shall promote their content, by ameliorating their condition. A Mechanical Department exists for rewarding the original invention or subsequent improvement of all machines and implements for Agricultural purposes, the construction of those for other branches of Rural Economy, and of some for domestic convenience. Models of these are received and preserved in the Society's Museum; and descriptions of all such as merit attention are as speedily as possible conveyed to the public.

Although certain subjects be thus selected as the objects of experiment or discussion, the patronage of the Society is not restricted to these objects. Its purposes being the promotion of general industry and improvement, it receives with favour every beneficial communication, and every statement of facts which may admit of an useful application.

The Papers of the Society are printed periodically in "THE QUARTERLY JOURNAL OF AGRICULTURE, AND THE PRIZE ESSAYS AND TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND," published by Messrs BLACKWOOD of Edinburgh, Mr CADELL of London, and Mr CUMMING of Dublin.

The Society is prepared to receive with attention all written communications, in the form of Essays, Reports, Notices of Experiments, and the like, which may be presented to it by LOCAL ASSOCIATIONS. Such communications, if approved of by the Society, will be inserted in the Transactions; and opportunity will be given to the Authors or Associations of obtaining separate copies from the types for circulation in the district.

All communications relating to Premiums, as well as Papers or Reports for publication in the Transactions of the Society, and other subjects for the consideration of the Directors, are to be addressed to SIR CHARLES GORDON, the Secretary of the Society, at the Society's Hall, Albyn Place, Edinburgh.

NOTICE TO CANDIDATES,

AND GENERAL RULES FOR COMPETITION.

When subjects are specially selected for competition, it is always to be understood, 1st, That however concisely the subjects themselves be announced, ample information is required concerning them—2d, That this information shall be founded on experience or observation, and not on simple references and quotations from books—3d, That it shall be digested as methodically as possible—and 4th, That Drawings, Specimens, or Models, adapted to a defined scale (3 inches to the foot if convenient), shall accompany writings requiring them for illustration.

Certain conditions are annexed to each of the various subjects of competition, as detailed in the List of Premiums; and these are rigidly enforced by the Society, as the only means of insuring regularity in the conduct of the business, and of distributing exact justice among the competitors.

In all Essays for Competition, for Premiums offered, it is expected that when facts not generally known are stated, they will be authenticated by proper references. Competitors in Essays are not to communicate their names, but shall transmit along with the Essays a sealed note containing their names and addresses, and inscribed on the back with some distinguishing motto or device, which shall also be inscribed on the Essay. When this regulation is neglected, such Essay shall not be received in competition. If the Essayist has formerly gained a Premium from the Society for a paper communicated by him, it is recommended that his subsequent Essay shall be written in a different hand from that of the former successful paper. Surveys, Essays, or Reports, of considerable length, must be bound, or inserted in a book, to facilitate their perusal.

None of the sealed notes, except those that bear the distinguishing motto or device of the Essays found entitled to Premiums, will be opened, and the sealed note will not in any instance be opened without the consent of the author, unless a sum equal to at least one-half of the Premium offered shall have been adjudged. But should no application be made for the papers on or before the 1st of March in each year, it will be held as belonging to the Society on the terms proposed. Such Essays as are not found entitled to any Premium will, with the sealed notes, be returned to the authors if required. The Society is to be at liberty to publish the Essays, or extracts from them, for which the Premium, or part of it, shall be awarded.

Candidates are requested to observe, that, in any instance, when Essays, Reports, or Certificates are unsatisfactory, the Society is not bound to give the reward offered; and that in certain cases, power is reserved of giving such part only of a Premium as the claim may be adjudged to deserve; but competitors may feel assured that the Directors will always be inclined to judge liberally of their several claims.

Essays, Reports, or Communications on subjects for which Premiums have in former years been offered, but not fully competed for, will still be received, although the subjects may now be discontinued on the List, and Honorary awards will be voted when the communications appear to merit them.

Essays and Reports, for which no Premiums have been awarded, must, if desired to be returned, be called for within one year from the date of Competition, otherwise the Society will not be responsible for the papers.

Competitors will understand it as a condition having reference to every Premium and reward offered by the Society, that the decisions of its committees and Board of Directors, as confirmed by the Society, are to be final and conclusive, and that it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

In reports of Experiments relating to the Improvement or Management of Land, it is expected that the expenses shall be accurately detailed.

In all Premiums offered, having reference to Weight or Measure, the New or Imperial Standards are alone to be understood as referred to; and Competitors are required to state their calculations according to these, the only legal standards, otherwise the claim will not be entertained.

When the Premiums are awarded in Medals or Plate, the Society will, in such cases as the Directors may see proper, allow them to be paid in money, on the application of the successful Candidates.

The Premiums awarded by the Society are payable after the 10th February, for the preceding year.

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Regulations for General Shows of Live Stock,	G. Macmikin Torrance, Esq. of Kilsaintninian.
The Argyll Naval Fund,	P. Small Keir, Esq. of Kinmonth.

PREMIUMS, *&c.*

Society's Hall, Albyn Place,
Edinburgh, 10*th Feb.* 1840.

The HIGHLAND and AGRICULTURAL SOCIETY of SCOTLAND does hereby advertise, That the undermentioned PREMIUMS are to be given by the Society in the Year 1840, &c.

CLASS I.

AGRICULTURAL MACHINERY.

1. APPLICATION OF STEAM TO THE CULTIVATION OF THE SOIL.

A Premium of Five Hundred Sovereigns will be awarded for the first successful Application of Steam Power to the Cultivation of the Soil.

By the cultivation of the soil are to be understood the operations of ploughing and harrowing, or preparing the soil in an equally efficient manner, and the other purposes for which animal power is now used; and the success of the invention will be judged of in relation to its applicability to the above purposes in the ordinary situations of farms in this country, and to the saving *in time*, *labour*, and *outlay*, which it may possess over animal power, as now generally employed in the cultivation of the soil.

The merits of the invention, with reference to the conditions enumerated, will be judged of by a Committee of the Society, specially appointed, and the inventor will be required to exhibit the machinery, and modes of applying it in Scotland. The Secretary, on application of intending competitors, will furnish any information which may be required.

The Society, in offering this Premium, does not feel it to be necessary to express opinions as to the probability of a successful application of steam to tillage, as to the means by which the object may be attained, or as to the effects which might be supposed to result from the application of such a power. But it has felt it to be a duty imposed upon it by its situation, to bring the subject in a proper manner before the country, to encourage those who are now engaged in this class of experiments, and to stimulate future invention, by the offer of a Premium corresponding, in some measure, to the interest and importance of the subject. Looking to the greatly extended application which has recently been made of steam as a motive power, and seeing that the difficulties which are opposed to its application to the purposes of the farm have been at least partially overcome by the efforts of individuals, it has appeared to the Society, that, without exciting expectations which may not be realized, a strong ground exists for having this possible application of steam-power made the subject of fair and satisfactory experiment.

2. IMPLEMENT FOR CUTTING DRAINS.

The Gold Medal, or a Piece of Plate of that value, will be given for an implement or implements, worked by horses, which shall produce the greatest saving compared with the expense at present incurred by manual labour, in Cutting Drains, in land where the subsoil is of a retentive nature.

The invention must be original, and specific information given as to the time when the implement was first used.

Models and Descriptions, with certificates of the efficiency of the implement, to be lodged, as after specified, with reference to implements submitted for the Premium No. 3.

3. INVENTION OR IMPROVEMENT OF IMPLEMENTS OF HUSBANDRY.

To the person who shall invent or improve any Instrument or Machine applicable to Husbandry or Rural Economy (other than those above specified), and which, from its utility in saving labour or expense, simplicity, or cheapness of construction, or other circumstances, shall be deemed by the Society deserving of public notice—The Gold or Silver Medal, or such sum in Money as the communication shall appear to deserve.

The account of the implement must be accompanied by a model made, when convenient, to a scale of three inches to the foot, to be deposited in the Society's Museum. The model to be formed of wood or metal, and the notice or description transmitted with it must specify, according to the best of the inventor's abilities, the purpose or advantage of his invention or improvement. When machines or models are transmitted, it must be stated whether they have been elsewhere exhibited or described. Models and Descriptions may be lodged at any time with the Secretary.

CLASS II.

ESSAYS AND REPORTS ON VARIOUS SUBJECTS.

1. GEOLOGICAL SURVEYS.

Fifty Sovereigns, or a Piece of Plate of that value, will be given to any person who shall, from his own observation, execute the best Geological Survey of any County or District in Scotland, except the following, viz. Berwickshire, the Lower District of Morayshire, Renfrewshire, the North of Ayrshire, the Middle or Lower part of Perthshire, Sutherlandshire, Fifeshire, Banffshire, and Lanarkshire, which are already reported on.

The author must, to compete for this Premium, himself draw up a written Report or Essay on the Rocks and Soils of the District, and colour Geologically, in the fullest detail that the scale will admit of, a portion of Thomson's Atlas of Scotland (folio edition), corresponding to an extent of surface of not less than 200 square miles, and at the same time send a collection of specimens of rocks to illustrate both the Essay and the Map—all which must be lodged with the Secretary on or before the 20th of October in any year.

This Report must give a full description of the Geology and Mineralogy of the District represented, acccompanied by coloured sections of such portions of it as may appear to require this species of illustration, founded on actual observation: if in any case the sections should be ideal, it must be so stated. In this Report, the author will be required to explain the classification and subdivision of the different rock-formations he may have adopted, and, in general, to communicate every thing of interest or importance that may occur connected with the subject of the survey.

The author will be expected to have paid particular attention to the Topography of the District included in the survey, so as to be able to point out any errors or omissions he may have detected in the Map; or should he be able to procure a better survey of the district he is describing than that in Thomson's series of Maps, he will be permitted to avail himself of it, provided it be on a scale equally suited to the purpose.

The author is farther invited to direct his attention to the Soils of the District, so as to describe the ingredients of which they are composed, and whether they have been formed by the disintegration of the subjacent rocks, or have been transported from distant parts. Where the soil has been brought from a distance, the authors will state the quarters from which it appears to have been brought, as well as the boulders that occur in the soil, or are strewed over the district. It is necessary also, that the author should shew the connection between the agriculture of the district and its rocks and soils, in reference to their influence on the pastures, crops, and timber of the district. Where Peat-Mosses occur in the district, the author will be expected not only to describe their extent, depth, quality, and general character, subsoil on which they rest, and susceptibility of improvement, but also any remarkable particulars regarding their component parts, such as the kind of wood, nuts, plants, or leaves, which prevail, or their accidental extraneous contents, such as horns, or any remains of works of art. Authors, in describing the country, must also notice any remarkable or interesting spring waters, particularly in respect to their temperature, and to the medicinal or other properties they may appear to possess. If not already sufficiently known, a chemical analysis of such waters as may be considered likely to be of importance must accompany the Report. It is particularly requested that the rock specimens constituting the collection may be carefully selected, fresh, and characteristic; and it is very desirable that they should be as uniform as possible in size and form. The following dimensions are recommended, viz. length, four and a half inches; breadth, three and a half inches; thickness, from one to two inches. There must of course be many exceptions to this rule, as, for example, in the case of very coarse conglomerates, large grained granites, basaltic columns, junctions of rocks, organic remains, &c. The Report, Maps, Sections, and Specimens of the different Rocks referred to in the Report, are, in the event of the author being found entitled to a Premium, to be the property of the Society.

Further, for Geological Surveys deemed worthy of distinction, but which may not be found entitled to the principal Premium in the year in which they are lodged, the Society's Gold or Silver Medal will be awarded to the authors. And, in order to hold out every encouragement to geologists to assist the Society in the important object of completing Geological Surveys of the various Districts of Scotland, it has been resolved, that, should any Survey not obtain a Premium in the year in which it is transmitted, the author shall be entitled to amend it by farther observation, and to bring it forward for competition in a future year.

The Surveys in competition for this Premium in 1840, to be lodged on or before the 20th of October next, under the conditions on pages 5 and 6.

Note.—Two Hundred Square Miles being the smallest extent for which the above Premiums are, under any circumstances, to be awarded, will only be considered sufficient in cases in which the Competitors shall have selected for the subjects of their Surveys and Reports, those Districts which, from the variety or the complexity of the geological formations, and the importance of the mineral resources they contain, possess the greatest degree of public interest, and, at the same time, require the most time, labour, and talent, to describe with the minuteness and accuracy expected.

It must, therefore, be distinctly understood, that the Maps and Descriptions of less interesting parts of the country in which a more uniform geological structure, and a greater sameness of mineral character, are found to prevail, will not be entitled to the Premium, unless they shall comprehend such an increase in the number of square miles beyond the minimum extent above specified, as the Directors may judge to be fairly proportioned to the circumstances of the case in these respects, and to the comparative facility with which the work may consequently appear to have been performed.

2. REPORTS ON COAL DISTRICTS.

Thirty Sovereigns, or a Piece of Plate of that value, will be given for the best Geological and Mineralogical Report upon any Coal District in Scotland, with the exception of those situated in the South-east part of the County of Fife, the North of Lanarkshire, at Muirkirk in Ayrshire, in the Parish of Dunfermline, Fifeshire, in the Parish of Carluke, Lanarkshire, and at Quarter in Lanarkshire, which have already been reported on.

In these Reports, it is expected, that, besides a general description of the district, the principal shaft sections, shewing the order of superposition and succession, as well as the thickness of the different strata, together with their lines of bearing, the direction and degree of their dip, and their organic contents, shall be carefully noticed and accurately detailed. The occurrence of slips, faults, or other disturbances, their direction, and the effects occasioned by them on the adjacent strata, must also be particularly noticed, with an explanation of their probable origin. The author must also particularly describe the trap-rocks, if any exist, in the Coal-Field, and specify their nature, situation, and extent. He will also state whether they intersect the other strata in the form of dykes, or in what other way they occur; and in each case he will describe what effect has been produced by them on the contiguous sedimentary strata. Limestone, iron, or any other profitable mineral or metallic substances in the district, must likewise be specially noticed.

Each Report must be accompanied by a general map or plan of the district, and coloured sections taken through such parts of it as may best serve to illustrate the above details, and also by specimens of the different kinds of coal, the various stratified and unstratified rocks, and the organic remains occurring in the coal-field; all of which are, in the event of the author being found entitled to a Premium, to be the property of the Society.

The varieties of Coal occurring in the district must be mentioned, as well as the price of each variety at the pit-mouth. The use to which each variety of coal is generally applied must also be noticed.

It will enhance the value of the Essays, in the opinion of the Society, if they contain a statement as to the probable quantity of coal remaining in the district unworked, together with the data on which that statement rests. It would be desirable also, if information could be given generally as to the number of Pits where coal is worked in the district, and as to the quantity of coal (stated in tons) which, during each of the preceding three years, has been raised in it, the number of steam-engines, of colliers, and horses, employed to raise the same. Authors are invited also to direct their attention to the moral and social condition of the persons employed in the collieries.

Reports for the present year's competition to be lodged on or before the 20th of October next, under the conditions which will be found on pages 5 and 6.

No Report will be entitled to this Premium unless the whole of the above conditions shall have been strictly fulfilled; and its merits will be estimated with reference to the amount and value of information given, rather than to the extent of country described.

The Society's Gold or Silver Medal will be given for such Reports on Coal Districts as may be found worthy of that distinction, but which may not be considered entitled to the principal premium, provided they are lodged with the Secretary by the time specified.

NOTE.—The Society takes this opportunity of pointing out to the Proprietors and Managers, and other individuals employed in Coal-Works, how much they have it in their power to contribute to the advancement of science, by noticing and preserving the organic remains that have been, or may be, found in the Coal-Fields with which they are respectively concerned. Fossil remains are most commonly met with in limestone, slate-clay, bituminous shale or blaes, and in the nodules and bands of ironstone; and it is earnestly recommended, that the miners should be directed to lay aside, and to preserve as entire as possible, every extraneous substance of unusual form and appearance, which they may find in any of the beds in which they are working.

The Society will at all times be glad to receive communications on this subject, accompanied by specimens, and will confer Honorary Premiums upon those individuals who may most distinguish themselves by their intelligence, zeal, and diligence, in bringing important and interesting discoveries of this nature to its notice.

3. MINES AND MINERALS.

The Gold Medal, or a Piece of Plate of such value as the communication may be adjudged to deserve, will be given for the most satisfactory Report, describing all the useful Metals or Minerals which might be profitably worked, and which are not now worked, in any particular District in Scotland, with the exception of Lismore, Appin, and Ardchattan, already reported. The district reported on must not be less than fifty square miles. The Reports must be accompanied with specimens of the Metals or Minerals described; and these must, for the present year's competition, be lodged on or before the 20th October next, under the conditions on pages 5 and 6, and remain the property of the Society, in the event of a premium being awarded to the Reporter.

4. PRODUCTS OF PEAT-MOSS, LARCH PRUNINGS, &C.

The Gold Medal will be given for the best and approved Account of the Uses to which Peat-Moss, Larch Prunings, &c. may be beneficially applied, and especially as to the extracting of Tar from these substances, and its application to the Smearing of Sheep, and other purposes to which foreign wood tar is now applied.

It is expected that the Competitors shall detail the experiments on which their Reports are founded, and shall add such observations as may occur on the production of Pyroligneous Acid from the same materials. Reports to be lodged on or before the 20th October 1840, under the conditions which will be found on pages 5 and 6.

5. PRODUCTION OF SCOTTISH SULPHUR.

I. The Gold or the Silver Medal will be awarded, according to circumstances, for the most satisfactory descriptive account of beds, masses, or veins of common Iron-Pyrites, or Sulphuret of Iron, or other compound of Sulphur, existing in Scotland.

The communication must particularly specify the local situation of the different beds, masses, or veins, their extent or dimensions, as far as can be ascertained, the quantity of pyrites found in average specimens of the compound, and the kinds of rocks in which it occurs. The practicability of working the beds or veins, and the means of transport, should be adverted to.

Specimens exhibiting the average richness of the compound must accompany the account, care being taken to place numbers or tallies on the specimens, corresponding with numbers mentioned in the descriptive accounts.

II. The Gold Medal will be given for the best account of an economical mode of Extracting the Sulphur from common Iron-Pyrites, or such Sulphur-compound as may be found in Scotland, by roasting and sublimation, or otherwise.

Reports for both Premiums to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

6. EXTENDING APPLICATION OF WATER AND OTHER POWER TO FARM PURPOSES.

Twenty Sovereigns, or Plate of that value, will be given for the best and approved Essay on the Extending of the Application of Water and other Power to Farm purposes.

The writer must enumerate the various subordinate purposes to which the power impelling thrashing-machines may be applied, such as cutting turnips, chopping hay, &c., and describe the safest, simplest, and most economical way of connecting the first power with these subordinate machines. He must also point out how premises at present generally in use for thrashing-machines may be most conveniently adapted to these other purposes, and what better arrangement could, with the same view, be made in the erection of new premises.

The writer is requested to state his opinion as to the best construction of the first power; that is to say, if steam be used, whether beam, crank, or any other kind of engine, and whether on the condensing or non-condensing principle; if water be used, whether overshot, undershot, or breast-wheel, and so on with respect to other powers. The writer must accompany his Essay with explanatory Drawings and Estimates, to shew that his plans will not be attended with any undue outlay or expense.

Reports to be lodged by 20th October 1840, under the conditions on pages 5 and 6.

7. IMPROVED SHEEP SALVE.

A Premium of Twenty Sovereigns, or Plate of that value, will be given to the person who, on or before the 20th October 1840, shall lodge with the Society a specimen of a salve which can be economically employed for Smearing Sheep, with a view to secure the health and comfort of the animal, without deteriorating the value of the fleece or carcass, and which shall have been proved by at least two successive years' use on the same stock, not under 20 scores—one-fourth of the animals upon which the experiment is repeated, being the same as those upon which it was formerly tried.

The Society understands that of late years a variety of new substances have been tried, which have either entirely or partially failed, and the wool-growers, especially in the Highland Districts, have been obliged to resort to the former plan of using tar and grease, believing from experience that no other known substance sufficiently protects the animal from cold and wet.

The great objection to tar is, that the value of the wool smeared with it is very much lowered, from the manufacturer being unable to render it sufficiently white to dye it any bright colour.

The Society is therefore anxious to procure a salve which will obviate this disadvantage, at the same time that the health and condition of the stock on which it is used may be completely preserved.

The Essays, with specimens and a description of the Salve,—a spemen of the Wool,—and a note of the price obtained for it, to be lodged by 20th October 1840, under the conditions on pages 5 and 6.

8. INSECTS INJURIOUS TO WHEAT.

The Gold Medal, or Plate of that value, will be given for the best and approved account of Insects injurious to Wheat.

Reports to be lodged on or before the 20th October 1840, under the conditions similar to those specified for No. 10.

9. INSECTS INJURIOUS TO TURNIPS.

The Gold Medal, or Plate of that value, will be given for the best and approved account of Insects injurious to Turnips.

Reports to be lodged on or before the 20th of October 1840, under the conditions similar to those specified for No. 10.

10. INSECTS INJURIOUS TO FOREST-TREES.

The Gold Medal, or Plate of that value, will be given for the best and approved account of Insects injurious to Forest-Trees, especially the Larch and the various species of Pine.

Reports to be lodged on or before the 20th October 1840, under the conditions which will be found on pages 5 and 6.

It is required that the Essays for the Premiums Nos. 8, 9, and 10, be the result of personal observation; specimens of each Insect, in its various stages, to be transmitted along with the Report—the nature and extent of the damage caused by the Insects to be explained—and the most effectual remedies which have been employed for preventing or checking their ravages, to be described; and further, a distinct account to be given of the nature and condition, exposure, and altitude above the sea, of the ground on which the plants or trees reported on were grown.

NOTE.—Accounts, by scientific entomologists, of noxious insects infesting the timber, bark, or foliage of trees, with suggestions for obviating their ravages, will be very acceptable to the Society, and Honorary Premiums will be awarded to the authors of such communications, according to circumstances.

11. COMPARATIVE NUTRITIVE PROPERTIES OF GRASSES.

Twenty Sovereigns, or Plate of that value, will be given to the Proprietor or Tenant in Scotland who shall, on or before the 20th October 1840, transmit to the Society a satisfactory Report of Experiments made to ascertain the comparative nutritious qualities of the ordinary Grasses at different ages, on the same quality of soil, and managed in the same manner.

The experiments to be made by the feeding of Milch Cows on pastures of different ages sown down in the same manner, and the same Cows may be pastured on the different fields of grass by alternate weeks or other equal periods, and the comparative produce ascertained by the quantity and quality of the milk produced. It is required that the quality of the soil shall be described, and the ages and kinds of Grasses of which the pastures consist, and that the breed of cattle and other particulars necessary to bring out a satisfactory result shall be given. Competitors are referred to the conditions, which will be found on pages 5 and 6.

12 EXTIRPATING FERNS FROM PASTURE.

Fifteen Sovereigns, or a Piece of Plate of that value, will be given for the best and approved account, founded on experience, of a cheap mode of eradicating Ferns from Pastures, and particularly from Hill Pastures, where the plough cannot be employed.

The extent of ground subjected to the experiment must not be less than twenty acres; the Report must state what proportion of the surface was occupied by the Ferns, with the expense per acre incurred in their eradication, and must be lodged with the Secretary, accompanied by specimens of the Ferns destroyed, on or before the 20th October 1840, under the conditions on pages 5 and 6.

There is evidence in favour of the belief that the object in view may be accomplished by repeated irrigation of the ground; also, that repeated cuttings of the Ferns while young and succulent, thus preventing their bringing their tops to perfection during the whole season, or two consecutive years, will destroy them. It is desirable that the truth of these opinions should be established or refuted, and any other successful mode of treatment pointed out.

13. THOROUGH DRAINING.

The Society being desirous of obtaining information on the advantages arising from the system of thorough draining, offers

Twenty Sovereigns, or a Piece of Plate of that value, for the best and most satisfactory account of an experiment, made on not less than four acres of land, one-half of which shall have been Thorough Drained, and the other half Undrained. The crop to be of the same description on both portions of the field, and the cultivation in other respects as nearly as possible under the same circumstances. The quantity and quality of the produce of each portion to be stated. The dimensions of the Drains, their distance, and the materials with which they were filled, to be noticed, and the expense of the improvement given, with such other observations as the experimenter may deem deserving of attention. Reports of experiments made in two or more years will give greater satisfaction than those which have been made in one year only. Reports to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6.

14. SUBSOIL-PLOUGHING OF THOROUGH-DRAINED LAND.

With the view of obtaining farther information as to the advantage of the Subsoil-Ploughing of Thorough-drained Land,

Twenty Sovereigns, or a Piece of Plate of that value, will be given for the best and most satisfactory account of an experiment made on not less than four acres of land, of as nearly as possible the same quality and description, one-half of which shall have been Subsoil-Ploughed, and the other cultivated in the ordinary way;

the whole to be under the same description of crop, and in other respects both portions to be cultivated and managed alike. The quantity and quality of the produce of each portion to be stated; the depth reached by the subsoil-plough to be noticed; with such other observations as the experimenter may deem deserving of attention. Reports to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

15. MOLE PLOUGH.

The Society, understanding that a considerable extent of ground has been successfully drained in England, at an expense not exceeding twenty shillings per imperial acre, by means of "the Mole Plough," offers a Premium of

Ten Sovereigns for the best and approved account of an experiment made in Scotland, in the years 1839 and 1840, on not less than five imperial acres of pasture or arable land, one-half of which shall have been drained in alternate portions of four or six ridges, and the other half left undrained.

Reports to be lodged with the Secretary on or before the 20th October 1840, under the conditions on pages 5 and 6.

16. EXPERIMENTS WITH MANURES.

The Society being desirous to ascertain, by experiment, the value of certain substances recently introduced as Manures, offers a Premium of

Twenty Sovereigns for the best and approved account of an experiment or experiments, shewing the fertilizing powers of at least four of the following substances, as compared with manures in common use:—1. Jauffret's Engrais; 2. Kimberley's Trotsworth Liquid Manure; 3. Rosser's Vegetable Decomposition; 4. Owen's Animalized Carbon; 5 Clarke's Desiccated Compost; 6. French Poudrette; 7. The Chemical Seed Manure, advertised to be prepared by Hodgson and Simson, at Walton, near Wakefield; 8. The Humus and Carbon, or the Paris and Flemish Fertilizing and Disinfected Composts, prepared by Lance and Co.; 9. Poittevin's Patent Disinfected Manure.

The extent of ground experimented on not to be less than a quarter of an acre for each description of manure. The quantity and cost of the different descriptions of manure employed, and the value of the crop produced by each, to be accurately ascertained and reported on, with such other particulars and observations as the Reporter may deem deserving of attention.

Competitors must, along with their Reports, transmit at least half a pound weight of the soil collected prior to the commencement of the experiment, and about the same quantity of each kind of manure employed. Reports to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6.

17. ANALYSIS OF BONE OR RAPE DUST.

Extensive experience having proved, that a ton of Bone or Rape Dust is equal, in the production of Turnips, to fifteen or twenty tons of well prepared farm-yard manure, the Society, considering it of importance to Agriculture to ascertain the element or elements contained in the two former, on which this superiority depends, offers

The Gold Medal, or Plate of the same value, for the best and approved Essay, founded on chemical analysis, shewing the element or elements in Bone and Rape Dust, which render them so much more efficient than farm-yard manure in producing Turnips.

The Essays will be expected to exhibit a chemical analysis of the three descriptions of manure mentioned, and of any other deemed by the competitors essential to the object of the Society in offering this Premium.

Essays to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

18. ON THE EFFECTS OF ALTITUDE ON VEGETATION.

For the best and approved Essay on the Effects of Altitude on Vegetation, in the same latitude,

The Honorary Gold or Silver Medal, according to the merits of the communication.

Regard to be had to the corresponding difference of altitude and latitude in respect to the production and perfection of culmiferous and leguminous crops, and the hay and pasture grasses, and also in respect to the growth of forest trees for timber. The nature of the soil and subsoil, and prevailing rocks, to be particularly attended to, and the distance from the sea to be specified. Essays to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6.

19. FEEDING OF CATTLE.

Twenty Sovereigns, or a Piece of Plate of that value, will be given for the best account of an experiment of the employment of substances other than the common produce of the Farm in the Feeding of Live-stock.

The substances on which experiments may be made are, Oil Cake, Rape Cake, Malt Dust, Brewers' and Distillers' Refuse, Sugar, Molasses, Sago, or any other nutritive food. The animals put up to feed not to be fewer than three Oxen for each kind of food on which the experiment is to be made. The live weight of the Oxen at the time of being put up to feed, must be determined and compared with that of an equal number of Oxen put up to feed on the common provender of the farm, as straw and turnips, hay and turnips, and the like; or, if the time of feeding shall be summer, grass used as herbage, or cut for soiling. The live, or, if possible, the dead weight, of both classes of animals, must be ascertained on the conclusion of the period of feeding; the quantities of food used in the experiment must be specified, and a calculation given of the expense of the two kinds of feeding. The quality of the meat to be stated when the competitor has it in his power to do so. Reports to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

20. FORESTS OF LARCH.

For the best and approved Essay on the more extensive cultivation of the Larch (*Larix communis*) in Scotland, particularly in reference to the expediency of forming extensive forests of that tree in the Highlands, with a view of supplying the Navy with timber—The Honorary Gold or Silver Medal, according to the merits of the communication.

Although the utility of Larch as naval timber is generally admitted, any additional evidence on the subject may with propriety be adduced. The Essayist will also be expected to point out the various situations or localities that may be deemed most suitable for the purpose, including an account of the soils, subsoils, rocks, and geological character of the Districts. The elevation above and distance from the sea should be stated as accurately as possible.

It will be of importance that particular notice be taken of the kind of soils and subsoils where the Larch has been found to form sound timber, and where it has proved liable to disease.

Competitors are referred to the Report on the Duke of Atholl's Plantations, published in the ninth volume of the Society's Transactions. In the essays to be now communicated the information must be original.

Essays to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

21. ON PLANTING WITHIN THE INFLUENCE OF THE SEA.

The Gold Medal, or Plate of the same value, will be given for the best Essay on successful Planting within the influence of the Sea, founded on extensive observation of the habits and appearance of the different sorts of Trees best suited for the purposes desired.

Great disappointments having arisen to landed proprietors, in many parts of the coasts of this country, in planting waste ground near the sea, the above Premium is offered with a view of directing attention to the subject.

Essayists are particularly desired to specify the kinds best suited, and to state the locality where such are to be seen, also the nature of the soil, elevation, &c. The Essays to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6.

22. SHELTER FOR SHEEP.

The Gold Medal, or Plate of the same value, will be given for the best and approved Essay, founded on actual experience or observation, shewing the advantages arising from affording suitable shelter to sheep in elevated districts, and of supplying them with hay, turnip, or other food during the winter and spring months; and on the most efficient and economical mode of accomplishing these objects.

The author will be expected to detail the kind and description of shelter which has been found most advisable, the kind and quantities of artificial food which have been found most suitable, and any other particulars connected with the management, to which attention should be directed. Essays to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

23. ON THE COMPARATIVE MERITS OF THE CROSS BETWEEN THE LEICESTER RAM AND CHEVIOT EWE, AND OF THE CROSS BETWEEN THE COTSWOLD RAM AND CHEVIOT EWE.

The Gold Medal, or Plate of the same value, will be given for the best and approved Report, founded on actual experiment, on the comparative merits of the produce of the Cross between the Leicester Ram and Cheviot Ewe, and of the cross between the Cotswold Ram and Cheviot Ewe.

The Society having received a favourable account, founded on experiments tried on a small scale, of the merits of the Cross between the Cotswold Ram and Cheviot Ewe, as compared with that between the Leicester and Cheviot, are desirous of having the result accurately tested, and with that view have offered the premium as above.

The Reports will be expected to contain an account of the comparative merits of the animals in every respect, when Lambs or Hogs, as well as when Shearlings, as regards shape, weight, quality of wool, aptitude for feeding, and hardiness of constitution.

The Reports to be lodged on or before the 20th October 1840, under the conditions on pages 5 and 6.

24. BOTHEY SYSTEM.

The Gold Medal, or Plate of the same value, will be given for the best and approved Essay on the evils resulting from the present Bothey System for unmarried Farm Servants, as existing in certain Districts of the country, with suggestions for their prevention and cure.

Essays to be lodged on or before 20th October 1840, under the conditions on pages 5 and 6.

25. SAVING OF LIQUID MANURE.

The Gold Medal, or plate of the same value, will be given for the best and approved Report, founded on practical experience, of the advantages arising from the application of Liquid Manure to the purposes of agriculture; and on the most efficient and economical mode of constructing Tanks, or other receptacles for collecting and saving the same in Farm Steadings.

Reports to be lodged on or before 25th October 1840, under the conditions on pages 5 and 6.

26. REPORTS ON IRRIGATION.

The Gold Medal, or a piece of Plate of the same value, will be given for the best and approved account of the Management of Water Meadows, founded on actual experiment within three years preceding the date of the Essay.

The experiments to be made on not less than five acres, whether detached or otherwise, and a description to be given of the rills or streams employed, and of the quality of the water, and of the manner of collecting and applying it, also an account of the land prior to introduction of irrigation upon it, and of its estimated value at that period, and at the time when the Report is made; certified statements to be made of the quality of grass, if any, cut green in the spring, and the quantity and quality of the hay and aftermath produced upon the portion reported on, and the kind of stock, if any, which has been allowed to depasture it.

The Essays, accompanied by a specimen of the hay produced that season, to be lodged on or before the 20th October 1841, under the conditions on pages 5 and 6.

27. ON RAISING IMPROVED VARIETIES OF GRAINS.

For a Report, founded on actual experiment, detailing the means which may have been successfully employed by the Reporter, for obtaining new and superior varieties of Grains, or improved subvarieties of those at present in cultivation, either by a minute attention to the selection of seeds by hybridation, or such other means as may have been found efficacious—The Gold Medal, or Plate of the same value.

It is necessary that the varieties or subvarieties reported upon, shall have been proved capable of permanent reproduction from seed, that the means employed for obtaining them be minutely stated, and also the relation they bear to others, or well-known sorts; the Reporter is farther requested to state the effects that he may have observed different soils, manures, &c. to produce on certain varieties of grains, and how far he may have ascertained such effects to be lasting.

Reports to be lodged on or before 20th October 1841, under the conditions on pages 5 and 6.

28. FEEDING OF FARM HORSES ON RAW AND ON PREPARED FOOD.

It having been represented to the Society, as the result of careful observation, that Farm Horses sooner attain good condition, though doing the same work, when fed with a given quantity of boiled or steamed Food, than when the same quantity is given to them in a raw state, the Society, desirous that this point, which accords with some recent scientific discoveries, should be further investigated, offers the following Premium:—

Twenty Sovereigns, or a piece of Plate of that value, will be given to the person who shall furnish the best and approved account of an experiment or experiments shewing how far the above statement is well founded. Competitors will be allowed to make the experiments with any of the usually cultivated descriptions of grain, such as Wheat, Barley, Oats, Beans, or Pease, and also with Sago, or other substances, and it is desirable that the accounts furnished should embrace as great a variety of these as possible.

Reports to be lodged by 20th October 1841, under the conditions on pages 5 and 6.

29. SHEEP PASTURES AT HIGH ELEVATIONS.

For the most satisfactory account of the Plants constituting the Herbage on very elevated and mountainous Sheep Pastures in Scotland, where Wedders are believed to thrive and fatten, so as to afford the finest mutton, and a similar account of the Plants constituting the old Pastures at the bases of mountains, understood to be favourable for Milch Cows, and adapted for the fattening of Cattle—A Gold Medal, or a piece of Plate of its value, in the option of the Competitor.

Some of the most elevated Sheep Pastures in Scotland, from 2000 to 3000 feet above the level of the sea, are considered by many sheep farmers to afford most nutritious herbage for feeding and fattening of prime wedders; such are those on the side of Benvoirlich, on the south-west of Strathconnan, on the high hills of Kintail, and on Benlawers in Perthshire. Various kinds of musci and lichens and other plants are intermixed with the alpine grasses at those heights. It is required that the botanical and common names of all the plants, phænogamous and cryptogamous, constituting the pasturage, should be given, and that their proportional abundance should be specified as nearly as can be guessed. Dried specimens of the plants will also be required, with their names attached. Botanists visiting those lofty districts may learn from the more intelligent and observing shepherds their opinions as to the nutritive qualities of the plants, or at least of particular districts of pasturage where certain plants chiefly abound. Minute inquiry should be made as to the kinds of mosses and lichens observed to be most readily and greedily cropped by the sheep, and the period of the year when the plants grow most vigorously. The occurrence of sea-shore plants (belonging, for example, to the genera *Statice* and *Plantago*) on these elevated stations should be adverted to, salt herbage being accounted both nutritious and fattening.

It has been remarked, that old pastures near the bases of mountains, which always contain, among the gramineous plants, an intermixture of various musci, afford excellent food for milch cows, the milk proving both plentiful and rich; and that such old mossy pastures are said to fatten cattle more readily than recent artificial pastures. The musci in these should be examined and compared as to their qualities with those found on the more elevated sheep-walks, and specimens should also be transmitted.

To be lodged on or before the 20th October 1841, under the conditions on pages 5 and 6.

30. SAVING OF TANNIN IN PREPARING THE BARK OF OAK COPSE.

According to the usual practice in the cutting of Oak Copse, and in the preparation of the Bark, the small branches, &c. are allowed to go to waste. As the bark and wood of those parts of the trees are stated to contain a large quantity of Tannin, it becomes an object to turn them to account, and the Society therefore offers the following Premium, viz. Ten Sovereigns, or a Piece of Plate of that value, for the best and approved Essay on the most efficient and economical plan for rendering available the Tannin contained in the bark and wood of the branches of oak copse.

An account must be given of the relative proportion of wood and bark in the branches, and of the quantity of tannin which may be obtained from each respectively; and a description must be furnished of the best mode of collecting and preparing the tannin for transportation to market.

Essays to be lodged on or before 20th October 1841, under the conditions on pages 5 and 6.

31. SALINE CONSTITUENTS OF PLANTS.

Twenty Sovereigns, or a piece of Plate of that value, will be given for the best and approved Essay, founded upon chemical analysis, on the following question:—To what extent can the Earthy and Saline Matter of Plants vary, both as to its chemical nature and the proportion of its various ingredients, without affecting the health and vigour of the plants themselves?

The subject is to be exemplified by the accurate chemical analysis of the earthy and saline constituents of several healthy specimens of at least four of the most important crops; the specimens chosen having been cultivated upon soils of different natures, and a careful comparison made between the various results.

Essays to be lodged on or before the 20th of October 1841, under the conditions on pages 5 and 6.

32. RADICAL EXCRETIONS OF PLANTS.

The Gold Medal and Twenty Sovereigns, or a Piece of Plate of that value, will be given for the best and approved Essay on the Radical Excretions of different Plants, or the various substances discharged from their Roots. Decandolle, Macaire, and others, from various experiments, have been led to suppose that different excretions are discharged from the roots of plants, which may probably account for their defects in deteriorating the soil for the production of the same species. The Essays are expected to give the result of original experiments determining the fact whether or not such excretions take place, and, if this is the case, to ascertain the chemical nature of the matter excreted from different plants, more especially the cultivated Gramineæ, Leguminosæ, and Cruciferæ.

Essays to be lodged on or before the 20th of October 1841, under the conditions on pages 5 and 6.

33. INVESTIGATION OF CERTAIN POINTS CONNECTED WITH THE SCIENCE OF AGRICULTURE.

In addition to the Premiums Nos. 31 and 32, and other particular subjects announced, the Society being desirous of encouraging such inquiries, and being aware how little is known with regard to some of the fundamental principles of Agriculture, will receive with favour, and reward liberally, Essays or Memoirs on any of the following subjects, the precise amount of the Premium being fixed by the Directors according to their opinion of the merits and value of the respective Essays.

With a view to this important object, the Society have set apart Fifty Sovereigns annually, to be awarded for such approved communications as may be lodged on any of the subjects referred to. In the event of papers being communicated in any year which shall appear to merit a sum greater than the Directors have at their disposal, some of these papers will be directed to stand over to receive rewards in a future year.

1. An Essay or Memoir explaining, on scientific principles, the mode in which Soil operates in producing or facilitating the Germination and Growth of Vegetables.

2. An Essay or Memoir describing and proving, on scientific principles, what is the best admixture of the ordinary elements of Soil for promoting the Germination and Growth of particular Vegetables.

3. An Essay or Memoir describing, on scientific principles, the mode in which lime operates in rendering the Soil better adapted for the Germination and Growth of particular Vegetables.

4. An Essay or Memoir explaining, on scientific principles, the

effect of Drainage in altering the constitution or qualities of the Soil, and increasing its fertility.

5. An Essay or Memoir shewing the nature of the Atmospheric Influences on Soil in promoting its fertility, including the modification of these influences arising from heat and cold, dryness and moisture.

> NOTE.—It is expected, and is to be explicitly understood, that the authors of the above Essays will not offer mere speculative conjectures on the subjects treated of, and far less make a compilation of the opinions of others. They must be able to state, that they have themselves studied and investigated the subject treated of. They must also explain the nature and the mode of inquiry adopted by them, and detail the experiments which they have instituted, from which their inferences have been derived. The Essays or Memoirs to be lodged by the 20th of October in any year, under the conditions on pages 5 and 6.

34. REPORTS ON IMPROVED RURAL ECONOMY ABROAD.

The Honorary Gold or Silver Medal of the Society, according to the value of the communication, will be given for approved accounts, founded on personal observation, of any useful practice or practices in Rural or Domestic Economy adopted in other countries, which may seem fitted for being introduced with advantage into Great Britain.

> However advanced the state of the Useful Arts may be considered in this kingdom, it is not to be doubted that there are many practices in use, both of Domestic and Rural Economy, in other countries, and particularly in France, the Low Countries, and the North of Germany, highly deserving of attention or imitation, and which are yet too apt to be disregarded or unnoticed by the traveller or casual resident. The purpose chiefly contemplated by the offer of the present Premium, is to induce gentlemen who may visit other countries to take notice of and record such particular practices as may seem calculated to benefit their own country in the branches of the arts referred to; and it is proposed that the earliest opportunity shall, in all cases, be taken of communicating such details to the public.

35. HONORARY PREMIUM FOR REPORTS ON CERTAIN DISTRICTS IN SCOTLAND.

To the person who shall, on or before the 20th October in any year, furnish to the Society the best account of a District in Scotland remarkable for any striking improvements that have been lately effected in it, whether with reference to its Husbandry, or to the establishment of useful Manufactories, of Fisheries, or of additional facilities for External or Internal Communications, such as Harbours, Railroads, or other means of public conveyance, including the state and management of Public Roads, and generally of such other improvements as have a direct tendency to increase the Physical Resources of the District—The Society's Gold or Silver Medal, or a piece of Plate, as the Directors may see fit in the circumstances of the case.

The report is expected to be given from the writer's experience or observation, and the extent of the district reported upon is not to be less than fifty square miles.

In describing the present state of husbandry, authors are required to advert to the general character of the surface in regard to its being rocky, or consisting of soil ; and, in describing the latter, they must state by what means it appears to have been formed, whether by disintegration of the subjacent or adjoining strata, or by transportation from other localities. The authors must also mention, and describe generally, the kind of trees which appear to thrive best within the district, and they must state whether, and what different kinds shew the most rapid and vigorous growth on the several descriptions of soil. They must also give an account of the prevailing native plants on uncultivated situations. Some account must likewise be given of the improvements made, or in progress, in the methods of tillage, the breeds of stock, the modes of cropping, the progress and methods of drainage, and the like. They will also give a particular account of any advantageous modes of managing estates and conducting their improvement, which may have been adopted by proprietors or their agents in the District.

Where Peat-mosses occur in the District, the author will be expected, not only to describe their extent, depth, quality, and general character, subsoil on which they rest, and susceptibility of improvement, but also any remarkable particulars regarding their component parts, such as the kind of wood, nuts, plants, or leaves which prevail, or their accidental extraneous contents, such as horns, or any remains of works of art.

In reference to the offer of the Premium, which is alternately made for *Manufacturing Improvements* in a District, authors must,in describing these, not only state the nature of the commodity or article manufactured, but also the nature of the machinery, and other means by which the manufactory is carried on; the number of persons of different sexes and ages employed, the value of the manufactory, the markets to which the articles manufactured are sent, the nature of the raw materials, and the source or sources whence they are respectively derived.

Authors, in treating of either kind of improvements, according as their knowledge and experience may best enable them, are required particularly to state the effects which have been thereby produced, not merely in respect of the annual revenue thence accruing, but also on the moral, social, and physical condition of the inhabitants. The authors should, in their accounts, mention the elevation of the principal points of the district above the sea. They are likewise invited to offer suggestions for the future improvement of the district, whether physically or morally.

It is further expected, that authors, if the district they undertake to give an account of happen to have been already described in any well-known publication, will avoid repeating the information which can be found there, and merely refer to such publication.

CONDITIONS OF COMPETITION FOR ESSAYS AND REPORTS.

The Conditions of Competition for Essays and Reports will be found under the "Notice to Candidates," on pages 5 and 6, to which Competitors are particularly referred.

The Essays and Reports on subjects 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, and 25, are to be lodged on or before the 20th October next, 1840; those on subjects 26, 27, 28, 29, 30, 31, and 32, by 20th October 1841; and those on subjects 33, 34, and 35, by 20th October in any year.

CLASS III.

WASTE LANDS.

1. IMPROVEMENT OF A SPECIFIED EXTENT OF WASTE LAND BY TILLAGE.

To the Proprietor or Tenant in Scotland who shall, on or before the 20th of October in any year, transmit to the Society the most satisfactory Report of having successfully improved and brought into profitable tillage, within a period of five years immediately preceding the date of his communication, an extent of waste and hitherto uncultivated Land, not being less than one hundred acres—The Gold Medal.

To the Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society a satisfactory Report of having, within the period of three years preceding the date of his Report, successfully improved, and brought into profitable tillage, an extent of waste and hitherto uncultivated Land, not being less than thirty acres on the same farm—The Honorary Silver Medal.

The Reports in competition for both Premiums may comprehend such general observations on the Improvement of Waste Lands as the writer's experience may have led him to make, but they are required to refer especially to the land reclaimed (which, if not in one continuous tract, must be in fields of considerable extent), to the nature of the soil, the previous state and probable value of the ground, the obstacles opposed to its improvement, the mode of management adopted, the expense, and, in so far as can be ascertained, the produce and value of the subsequent crops; and the land must have borne one crop of grain, at least, previous to the year in which the Report is made. The Reports must be accompanied by a detailed statement of the expense, and by a certified measurement of the ground. Competitors for the more limited extent improved will observe, that, having gained the Silver Medal, it shall not afterwards be competent to include the same improvement in a subsequent claim for the Gold Medal. Competitors for both Premiums will attend to the general conditions, which will be found on pages 5 and 6.

2. IMPROVEMENT OF A SPECIFIED EXTENT OF WASTE LAND FOR PASTURE.

To the Proprietor or Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society the most satisfactory Report of having, within the period of five years immediately preceding the date of his communication, successfully improved an extent of waste and hitherto uncultivated Land, not being less than one hundred acres, by draining, accompanied with irrigation or top-dressing with lime or other substances, or paring and burning the surface, and sowing grass seeds with or without a grain crop—The Gold Medal.

To the Tenant in Scotland who shall, on or before the 20th October in any year, transmit to the Society a satisfactory Report of having, within the period of three years preceding the date of his Report, successfully improved for pasture an extent, not being less than thirty acres on the same farm, of waste and hitherto uncultivated Land, in the manner indicated in reference to the immediately preceding Premium—The Honorary Silver Medal.

The Reports are required to advert to all the particulars specified in the conditions in the Premiums for the improvement by tillage, so far as these are applicable to the improvement of land for pasture; and the land must have been hayed or pastured three years at least previous to the year in which the Reports are made. The Reports must be accompanied by a detailed statement of the expense, and by a certified measurement of the ground. Competitors for the more limited extent will observe, that, having gained the Silver Medal, it shall not afterwards be competent to include the same improvement in a subsequent claim for the Gold Medal. Competitors for both Premiums will attend to the general conditions on pages 5 and 6.

CLASS IV.

CROPS AND CULTURE.

1. NEW PLANTS ADAPTED TO FIELD CULTURE.

To the person who shall, on or before the 20th October in any year, report to the Society any new species or variety of useful Plant, adapted to the ordinary field culture of Scotland—The Gold or Silver Medal, or a Piece of Plate, as the Directors may see fit in the circumstances of the case.

Particular attention is directed to the raising or procuring of new varieties of Cereal Grains, as well as of the more useful Herbage and Forage Plants; in the latter class a new variety of Italian Rye-grass, possessing the qualities of bulk of produce, permanency of duration, or other advantages calculated to render it superior to the common sort, will be considered an acquisition.

Satisfactory evidence will be required that the plant produced is new in the cultivation of the country; either as regards the species or variety, valuable as regards the uses to which it may be applied, and congenial to the soil and climate of Scotland. A particular detail of the discovery, or circumstances which led to the experiment, must be furnished, the mode of culture described, and a specimen of the plant transmitted; with such suggestions as to the probable value of its straw as experience may have enabled the competitor to afford.

2. SAVING HAY.

To the person in Scotland who shall in any one year have stacked not less than 500 Stones of Hay in the best condition, the produce of his own farm, or of the farm of which he is in charge—The Silver Medal.

In order to draw the attention of practical Agriculturists to the Saving of Hay, and to the papers on the subject which have been published in the Society's Transactions, six honorary appropriate Silver Medals will be assigned for three years successively upon the applications first lodged, and in the order in which they are applied for, under the following conditions:—

A certificate must be lodged with the Secretary by any two Members prior to the Summer half-yearly General Meeting of the Society, that not fewer than three persons have agreed to compete in any district during that season for some one description of Hay, whether Clover and Rye-grass, Natural Grass, Watered Meadow, or Upland; and that the competitors had agreed in naming a Judge to decide upon the quality of the Hay for which they intend to compete. The Judge to be so named shall inspect the Hay, and give his decision in writing betwixt the 1st and 20th of January following, and will award the Medal for the Hay of the best quality and in the best condition, if he shall be of opinion that any competitor merits it. A report of the award, accompanied by an account, to be furnished by the successful competitor, of the mode of treatment followed by him, and particularly of the time which elapsed betwixt the mowing and stacking, and whether the Hay was put into tramp ricks or carried at once to the stack, shall be immediately transmitted to the Secretary by the Members of the Society who signed the certificate; and on the receipt of the Report, the Secretary will forward the Medal to be delivered to the successful competitor.

3. STRAW PLAIT.

1. To the person who, in the years 1840 or 1841, shall have reaped and prepared in the best manner for Straw Plait, in any District of Scotland where Premiums for the preparation and manufacture of that article have not already been awarded by the Society, the greatest quantity of Rye Straw, on not less than two acres—Ten Sovereigns, or a Piece of Plate of that value.

Competitors to lodge with the Society, on or before the 20th of November 1841, average samples of their prepared Straw, accompanied by authenticated measurements of the ground upon which the crop was raised, with statements explanatory of the management throughout, of the nature and value of the soil, and of the value of the produce.

It has been represented to the Society, that rich or superior soils are unsuited to the growth of Rye Straw for Plait, and that waste sandy links, and inferior light soils in low or early situations, such as are frequent along both sides of the Firth of Forth, and other parts of the coast, are those on which its growth is most likely to prove profitable.

2. To the person who shall, between 30th January 1840 and 20th November 1842, have got Plaited or Manufactured, in any district of Scotland where Premiums for this branch of industry have not been already awarded by the Society, the greatest quantity of Rye Straw—Six Sovereigns.

To the person who shall have got Plaited or Manufactured the second greatest quantity as aforesaid—Four Sovereigns.

Competitors to produce certificates by two Members of the Society, attesting the quantity manufactured, and transmit samples of the different kinds of Plait made. They will also lodge an account of the expenditure and market value of the manufactured article, with information as to the class of persons employed, amount of their daily earnings, and such information generally as may be considered will forward the object in view, of encouraging the improvement of the female, juvenile and infirm portion of the labouring classes, by introducing habits of cleanliness and industry. Claims to be lodged by 20th of November 1842.

4. PLOUGHING COMPETITIONS.

Premiums to Ploughmen for improvement in Ploughing having for some years been given very generally over the country by the resident Gentlemen and Local Farming Societies, the Highland and Agricultural Society has, in the mean time, discontinued them; but being desirous of encouraging improvement in this branch of husbandry, the Society will give its Silver Plough Medal to the Ploughman found to be the best at such competitions, provided not fewer than fifteen Ploughs shall have started, and that Premiums in money to an amount not less than Three Sovereigns shall have been awarded. It shall be competent to the Judges of the competition, in deciding on the merits of the competitors, to take into consideration the time occupied in ploughing the ground assigned to the competitors respectively. The Medal will be issued upon a report from one or more Members of the Society, who shall have actually attended the competition, stating the number of Ploughs that had started, the number and amount of the money Premiums awarded, and that the Ploughman found to be the best had not received the Society's Medal at a previous competition in the same district.

The Report must be lodged with the Secretary, at the Society's Hall, within three months after the Competition, otherwise the Medal will not be issued.

CLASS V.

PASTURES.

1. MANAGEMENT OF PASTURE LANDS.

The Gold Medal, or a Piece of Plate of the same value, will be given to the Proprietor or Tenant in Scotland who shall, on or before the 10th of November in any year, report to the Society the most successful Management of Pasture Lands, founded on practice.

The land, forming the subject of the Report, must have been pastured for at least three seasons, exclusive of that in which the Report is given in, and the extent of ground must not be under ten acres. If the land has been sown down within a period of eight years previous to that in which the Report is made, the reporter will be required, besides stating the mode adopted in laying down, and the kinds and quantities of seeds used, to give a correct detail of the management from the period of sowing until the land be sufficiently consolidated for the purpose of being depastured. In any case, the reporter will be required to state the kind and quality of the soil, with its exposure and elevation, the mode of drainage, and the various proportions of grasses and other plants constituting the pasture; the means which have been employed in maintaining or increasing the productiveness of the herbage by top-dressing or otherwise; the description of stock grazed; and the modes which have been found most successful in practice, of preventing or destroying the growth of plants injurious to the pasture.

Competitors are referred to the general conditions, which will be found on pages 5 and 6.

CLASS VI.

LIVE STOCK—DISTRICT COMPETITIONS.

§ I. CATTLE.

PREMIUMS FOR IMPROVING THE BREED OF CATTLE IN THE FOLLOWING DISTRICTS:—

1. *The Districts of Eskdale and Liddesdale, in the Counties of Dumfries and Roxburgh.*
2. *The Islands of North and South Uist, Harris, Barra, and small Isles adjacent, in Inverness-shire.*
3. *The Districts of Breadalbane, Glenorchy, Glenlyon, Glenochy, Glendochart, Glenfalloch, and Rannoch, comprehending the parishes of Kenmore, Killin, Glenorchy, Fortingall, Dull, Weem, and Logierait, in the Counties of Perth and Argyll.*
4. *The District of Garioch, Aberdeenshire.*
5. *The Eastern District of Fifeshire, comprehending the parishes of Kilconquhar, Elie, St Monance, Pittenweem, Carnbee, East Anstruther, West Anstruther, Kilrenny, Crail, Kingsbarns, St Andrews, Denino, Cameron, Leuchars, Newburn, Largo, Leven, Scoonie, Forgan, and Ferry-port-on-Craig.*
6. *The Parishes of Inveravon, Kirkmichael, Mortlach, and Aberlour, in Banffshire, and Cabrach and Knockando, in Aberdeen and Moray shires.*
7. *The Counties of Moray and Nairn.*
8. *The District of Turriff, in the Counties of Aberdeen and Banff.*
9. *The County of Linlithgow.*
10. *The District of Auchtermuchty, Fifeshire, comprehending the Parishes of Auchtermuchty, Falkland, Strathmiglo, Newburgh, Abdie, those parts of the Parishes of Arngask and Abernethy, in the County of Fife, and those parts of the Parishes of Collessie and Kettle lying to the westward of the Turnpike Road leading from New Inn by Trafalgar to Newburgh.*
11. *The Counties of Stirling and Clackmannan, and that part of the County of Perth which is under the jurisdiction of the Sheriff-Substitute of the Dunblane District.*
12. *The District of Formartin, in Aberdeenshire.*
13. *The County of Renfrew.*
14. *The Parishes of Banchory Ternan, Strachan, Birse, Kincardine O'Neil, Echt, Peterculter, Drumoak, Durris, Maryculter, Lumphanan, and Midmar, in the Counties of Aberdeen and Kincardine.*

15. *The Parishes of Cargill, Collace, Kinclaven, Cupar-Angus, Bendochy, Blairgowrie, Alyth, Ruthven, Airlie, Glammis, Essay, Nevay, Meigle, Newtyle, Kettins, and Caputh, in the Counties of Perth and Forfar.*
16. *The Parishes of Maybole, Kirkmichael, Straiton, Daily, and Kirkoswald, in the County of Ayr.*
17. *The County of Sutherland.*

For the best Bull, from two to seven years old, to be exhibited at the Competition in each of the four Districts, Nos. 2, 3, 6, and 17, as above described, *bona fide* the property of a Proprietor, Factor, or Tenant, and kept in his possession from the 20th day of May preceding the Competition—The Honorary Silver Medal.

For the best Bull, from two to seven years old, *bona fide* the property, and in possession, of any Tenant in each of the said four Districts, Nos. 2, 3, 6, and 17, kept on his farm within the District, from the 20th day of May preceding the Competition—Ten Sovereigns.

For the second best Bull, of the same age, in each of the said four Districts, the property, and in the possession, of any Tenant, and kept on his farm within the District for the foresaid period—Five Sovereigns.

For the best two Queys of three years old, the property of, and bred by, any Tenant in each of the three Districts, Nos. 2, 3, and 17, above described—Five Sovereigns.

For the second best two Queys of three years old, the property of, and bred by, any Tenant in each of the said three last-mentioned Districts—Three Sovereigns.

For the best two Queys of three years old, the property, and in possession, of any Tenant in the said District No. 6, above described, from the 20th day of May preceding the Competition, and which shall be kept by him within the District for at least one year after the award of the Premium—Five Sovereigns.

For the second best two Queys of three years old, the property, and in possession, of any Tenant in the said last-mentioned District, to be kept as aforesaid—Three Sovereigns.

For the best Bull, from two to seven years old, *bona fide* the property, and in possession, of any Proprietor or Tenant, in *each* of the thirteen Districts, Nos. 1, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16, as above described, kept on his farm, within the District, from the 20th day of May preceding the Competition—Ten Sovereigns.

For the second best Bull, of the age above specified, *bona fid* the property, and in possession, of any Proprietor or Tenant, in *each* of the said thirteen Districts, and kept on his farm, within the District, for the aforesaid period—Five Sovereigns.

For the best two Queys of two years old, the property of, and bred by, any Tenant in *each* of the said thirteen Districts, Nos. 1, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16—Five Sovereigns.

For the second best two Queys of two years old, the property of, and bred by, any Tenant in each of the said thirteen Districts—Three Sovereigns.

The Competition in the Districts Nos. 1 to 11, both inclusive, will take place in 1840, and in Nos. 12, 13, 14, 15, 16, and 17, in 1841.

The following Members of the Society (as Members only, or their Factors in their absence can be named), are hereby appointed Committees for regulating all details at the Competition for the eleven Districts first above mentioned. In Districts Nos. 12 and 13, Committees were named in the advertisement of 1839, and the Committees for the Districts Nos. 14, 15, 16, and 17, will be intimated in that of 1841.

FOR THE FIRST DISTRICT.—The Duke of Buccleuch; Lord John Scott; the Right Hon. Sir James Graham, Bart. M. P.; J. J. Hope Johnston, Esq. M. P.; William Blamire, Esq. formerly M. P. for Cumberland; Thomas Chalmers Borthwick, Esq. of Hopesrig; G. Scott Elliot, Esq. of Larriston; Geo. Bell, Esq. Woodhouselees; A. H. Maxwell, Esq. of Portrack; W. Oliver Rutherford, Esq. of Edgerston; Major Oliver of Bush; Thomas Stavert, Esq. of Hosecoat; Alexander Scott, Esq. of Knockhill; Alexander Stevenson, Esq. Banker, Langholm; *and any other Members in the District;* three a quorum. The Duke of Buccleuch, in his absence Mr Scott Elliot, to be Convener.

FOR THE SECOND DISTRICT.—Lord Macdonald; R. G. Macdonald, Esq. of Clanranald; R. MacNeill, Esq. of Barra; R. Macdonald, Esq. of Bornish; Donald Maclean, Esq. of Boreray; Duncan Shaw, Esq. factor to Lord Macdonald; Charles Shaw, Esq.; Mr Stewart Harris; *and any other Members in the District;* two a quorum. Lord Macdonald, in his absence Mr Duncan Shaw, to be Convener.

FOR THE THIRD DISTRICT.—The Marquis of Breadalbane; Sir Neil Menzies, Bart.; Sir Wm. Drummond Stewart, Bart.; Major-General Sir Archd. Campbell, Bart. G. C. B.; Archibald Butter, Esq. of Fascally; The Rev. T. Buchanan, Logierait; J. L. Campbell, Esq. of Glenfalloch; Archibald Campbell, Esq.

factor on the estate of Menzies; Colonel J. Macdonald of Dalchoisnie; James Menzies, Esq. of Pitnacree; John Menzies, Esq. of Chesthill; Major Archibald Menzies, late 42d Regiment; Mr Cumming Menzies, of Knockintober; Alexander Stewart, Esq. of Derculich; Alexander Stewart, Esq. of Glencribisdale; Robert Stewart, Esq. of Ardvorlich; George Stewart, Esq., Grandtully; John Stewart, Esq. of Findynate; W. B. Campbell Stewart, Esq. of Clochfoldich; James Stewart Robertson, Esq. of Edradynate; Robert Robertson, Esq. of Auchleeks; Mr Stewart, Chesthill; Mr Wyllie, Bolfracks; *and any other Members in the District;* five a quorum. The Marquis of Breadalbane, in his absence Sir Neil Menzies, to be Convener.

FOR THE FOURTH DISTRICT.—The Earl of Kintore; Sir John Forbes, Bart. of Craigievar; Sir R. D. Horn Elphinstone, Bart.; Lieutenant-General Sir A. Leith of Freefield; John Burnet, Esq. of Kemnay; Colonel W. H. Knight Erskine of Pittodrie; Captain Elphinstone Dalrymple of Westhall; Colonel Fraser of Castle Fraser; David John Gordon, Esq. of Wardhouse; James Gordon, Esq. of Manar; Robert Grant, Esq. of Tillyfour; Lieut.-Colonel Sir Andrew Leith Hay of Rannes; Patrick Irvine, Esq. of Inveramsay; George Leslie, Esq. of Rothie; William Leslie, Esq. of Warthill; H. Leith Lumsden, Esq. of Auchindoir; Hugh Lumsden, Esq. of Pitcaple; R. Mackenzie, Esq. of Glack; J. Mackenzie, Esq. younger of Glack; B. C. Urquhart, Esq. of Meldrum; Mr Walker, Suttie; *and any other Members in the District;* five a quorum. Sir R. D. H. Elphinstone, in his absence Mr Lumsden of Pitcaple, to be Convener.

FOR THE FIFTH DISTRICT.—Lord William Douglas; Sir Ralph Anstruther of Balcaskie, Bart; Sir David Erskine of Cambo, Bart.; Sir Henry Bethune, of Kilconquhar, Bart.; Major Anderson of Kingask; Gilbert Bethune, Esq. of Balfour; Lieut.-Colonel Briggs of Strathairly; Robert Bruce, Esq. of Kennet; William Berry, Esq. of Tayfield; George Cheape, Esq. of Wellfield; Alexander Chrystie, Esq. Elie Lodge; H. Craigie, Esq. of Hallhill; George Duncan, Esq., Balchrystie; J. B. Fernie, Esq. of Kilmux; William Graham, Esq. of Greigston; Charles Craigie Halket, Esq. of Halhill; Norman Hill, Esq. of Brownhills; Captain Kerr of Grange; Lieutenant-Colonel Lindsay, younger of Balcarras; The Rev. E. S. Lumsdaine of Blanerne and Inergelly; James Lumsden, Esq. of Lathallan; Thomas Elder MacRitchie, Esq. of Craigton; John Whyte Melville, Esq. of Mount Melville; David Monypenny, Esq. of Pitmilly; R. Gillespie Smyth, Esq. of Gibliston; James Nairne, Esq. of Claremont; J. Home Rigg, Esq. of Morton; Archibald John Stewart, Esq. of St Fort; John Thomson, Esq. Craigie; Bethune J. Walker, Esq. of Fallfield; John Wood, Esq. factor, Balcarras; James Wyld, Esq. of Gilston; *and any other Members in the District;* five a quorum. Colonel Lindsay and R. Bruce, Esq. of Kennet, in their absence Lieutenant-Colonel Briggs of Strathairly, to be Conveners.

For the Sixth District.—The Duke of Richmond; the Earl of March; the Earl of Fife—the Hon. Colonel Grant of Grant, M.P.; Sir George Macpherson Grant, of Ballindalloch, Bart.; John Macpherson Grant, Esq. yr. of Ballindalloch; William Grant, Esq. yr. of Elchies; Mr Grant Ruthven; Colonel Gordon, Inverlochy, C.B.; Arthur Thomas Gregory, Esq. of Buchromb; Major Stewart, Pittyvaich; Mr Macinnes, Dandaleith; Mr Skinner, Drumin; Mr Gordon, Croughley; Mr MacGregor, Delavorar; Mr Smith, Castleton; Mr Stewart, Deskie, *and any other Members in the District,* three a quorum; Sir George Macpherson Grant, in his absence, Mr Skinner, to be Convener.

For the Seventh District.—The Duke of Richmond; the Earl of March—the Earl of Moray; the Earl of Cawdor; Viscount Emlyn; Lieutenant-General the Hon. Sir Alexander Duff; the Hon. Colonel Grant of Grant, M.P.; the Hon. John Stuart; Sir A. Dunbar of Northfield, Bart.; Sir W. C. Gordon of Altyre, Bart.; Sir George Macpherson Grant of Ballindalloch, Bart.: Major-General Sir John Rose of Holm; Archibald Dunbar, Esq. younger, of Northfield; P. B. Ainslie, Esq.; Lieutenant-Colonel James Brander of Pitgaveny; James Campbell Brodie, Esq. of Lethen; William Brodie, Esq. of Brodie; Alexander Brown, Esq. Secretary Morayshire Farmer Club; Peter Brown, Esq. Linkwood; Dr James Bayne; C. L. Cumming Bruce, Esq. of Roseile and Kinnaird; William Macpherson Christie, Esq. Ballimore; Hugh Davidson, Esq. of Cantray; Richard W. Duff, Esq. of Orton; John Forsyth, Esq. Forres; Captain William Fraser, Brackla; Robert Fraser, Esq. Brackla; Colonel Gordon, C B.; Captain Gordon, Rerack; F. W. Grant, Esq. younger of Grant; J. Macpherson Grant, Esq. yr. of Ballindalloch; Robert Grant, Esq. of Kincorth; William Grant, Esq. yr. of Elchies; J. Augustus Grant, Esq. of Viewfield; John Gollan, Esq. of Gollanfield; Major-General D. Macpherson, Burgie; Norman M'Leod, Esq of Dalvey; Lieut.-Colonel D. Macpherson, Ardersier; John M'Innes, Esq. Dandaleith; William M'Intosh, Esq. of Geddes; William M'Killigan, Esq. of Relugas; Graham Speirs, Esq. Sheriff of the County; William Alexander Stables, Esq. of Park; Francis Smyth, Esq. of

Knockomie; Patrick Sellar, Esq. of Westfield; William Fraser Tytler, Esq. of Balnain; William Young, Esq. of Burghead, *and any other Members in the District;* five a quorum.—Sir A. Dunbar and Robert Grant, Esq. of Kincorth to be Conveners.

For the Eighth District.—The Earl of Fife; Lieutenant-General the Hon. Sir Alexander Duff; Sir Robert Abercromby of Birkenbog, Bart; John Adam, Esq. Turiff; James Allardes, Esq. Boyndsmill; Alexander Currie, Esq. Sheriff of Banffshire; John Duff Dingwall, Esq. of Brucklaw; Garden Duff, Esq. of Hatton; James Grant Duff, Esq. of Eden; Thomas Abercromby Duff, Esq. of Haddo; Major P. Dunbar of Mountcoffer; Captain Ferguson of Pitfour, R. N.; John Taylor Gordon, Esq. of Nethermuir; William Gordon, Esq. of Fyvie; Alex. Forbes, Esq. of Boyndlie; Alexander Grant, Esq. of Carnousie; James Rose Innes, Esq. of Netherdale; Alexander Keith, Esq. Netherthird; George Leslie, Esq. of Rothie; H. George Leslie, Esq. of Denlugas; Harry Leith Lumsden, Esq. of Auchindoir; James W. Mackenzie, Esq. Pittrichie; George Garden Robinson, Esq. Banff; John Brodie Spottiswoode, Esq. of Muiresk; Alexander Stewart, Esq. of Laithers; George Campbell Smith, Esq. Banff; B. C. Urquhart, Esq. of Byth and Meldrum; Archibald Young, Esq. Banff; *and any other Members in the District;* five a quorum.—The Earl of Fife, in his absence, James Grant Duff, Esq of Eden, Convener.

For the Ninth District.—The Earl of Rosebery; the Earl of Hopetoun; Lord Dalmeny, M.P.; Sir Thomas Livingstone of Westquarter; Sir James Dalyell of Binns, and Sir William Baillie of Polkemmet, Barts.; Robert Bauchope, Esq. Kinneil; D. C. Cameron, Esq. of Foxhall; Gabriel Hamilton Dundas, Esq. of Duddingstone; David Falconer, Esq. of Carlowrie; George Falconer, Esq. yr. of ditto; W. D. Gillon, Esq. of Wallhouse, M.P.; John F. Hamilton, Esq. of Westport; James M. Hog, Esq. of Newliston; Joseph Hume, Esq. of Horndean and Lochcote; James Johnstone, Esq. of Straiton; Major Norman Shairp of Houston; Major J. Kerr Ross of Laurencepark; John Stewart, Esq. of Binny; Peter Thomson, Esq. Hangingside; William Wilkie, Esq. of Ormistonhill; Alex. Duncan, Glendivine; *and any other Members in the District;* three a quorum. The Earl of Rosebery, in his absence, J. M. Hog, Esq. of Newliston, Convener.

For the Tenth District.—The Earl of Leven and Melville; the Hon. William Leslie Melville; O. Tyndal Bruce, Esq. of Falkland; George Cheape, Esq. of Wellfield; Charles Kinnear, Esq. of Kinnear; David Maitland Makgill Crichton, Esq. of Rankeillour; Lieutenant-Colonel Millar of Urquhart; Patrick George

Skene, Esq. of Hallyards; Archibald Walker, Esq. Auchtermuchty; *and any other Members in the District;* three a quorum. O. T. Bruce, Esq., and Archd. Walker, Esq. or either of them, to be Conveners.

FOR THE ELEVENTH DISTRICT.—The Earl of Dunmore; Lord Abercromby; Hon. George Ralph Abercromby, M.P.; Sir Gilbert Stirling, Bart.; Robert Bruce, Esq. of Kennet; H. Home Drummond, Esq. of Blairdrummond; William Forbes, Esq. of Callander; James Johnstone, Esq. of Alva; John Burn Murdoch, Esq. of Gartincaber; William Murray, Esq. of Polmaise; William R. Ramsay, Esq. of Barnton; C. D. Stirling, Esq. of Glenbervie; *and the other Members in the District*; three a quorum; William R. Ramsay, Esq. of Barnton, and William Murray, Esq. of Polmaise or either of them, to be Conveners.

FOR THE TWELFTH AND THIRTEENTH DISTRICTS the Committee remain as last year, with the addition of those resident Members since elected.

IN THE FOURTEENTH DISTRICT.—Sir Thos. Burnett of Leys, Bart. in his absence, William Innes, Esq. of Raemoir, to be Convener.

IN THE FIFTEENTH DISTRICT.—Sir J. Muir Mackenzie of Delvine, Bart. in his absence, Mr Watson, Keillor, to be Convener.

IN THE SIXTEENTH DISTRICT.—Sir Charles Dalrymple Fergusson of Kilkerran, Bart., in his absence, Elias Cathcart, Esq. of Auchindrane, to be Convener.

AND IN THE SEVENTEENTH DISTRICT.—The Duke of Sutherland, in his absence, George Gunn, Esq. Rhives, to be Convener of the Committee of resident Members.

RULES OF COMPETITION.

1. The Conveners, with the approbation of a quorum of the Committees for conducting the several competitions, are respectively authorized, in such cases as they shall see proper, to divide the two Premiums allowed for Bulls into three Premiums, in such proportions as they shall approve; the first Premium for Bulls not being less than Eight Sovereigns; and, in like manner, to divide the sums allowed for Queys into three Premiums, fixing their amount.

2. The Committee shall not place for Competition any Stock which, in their opinion, does not fall within the regulations prescribed, or does not possess merit; and in no instance shall any of the Money Premiums be awarded, where there are not, after such selection, at least three Competitors, reserving to the Committee, in the case here provided for, to make such allowance to a party shewing stock of merit, not exceeding half the amount of the Premium, as under the circumstances they may think reasonable.

3. The times and also the places of Competition are to be fixed by the Convener, with the advice of at least a quorum of their respective Committees, except in the 2d and 7th Districts, as to which Benbecula is named as the place of Competition for the former, and in the latter Elgin and Forres alternately are fixed. The Competition for the Society's and for the District Premiums are to take place between the 1st of June and 1st day of November next.

4. The Convener of each Committee will give timely notice to the other Members of the Committee of the place and time of the Competition, and will be particularly careful that the same be intimated at the several parish church-doors within the District, for at least two successive Sundays previous to the Competition, or in such other form as shall be previously approved of by the Local Committee.

5. As these Premiums were given, in some of the above-mentioned Districts, in 1835, 1836, 1837, 1838, and 1839, it is to be observed, that the Society does not admit an animal, in any class of Stock, which may have gained the Society's first Premium at a District or General Show in a former year, to be again shown in Competition in any District; and for no description of Stock shall either the same or a lower denomination of Premium be awarded, in the District in which they have already gained a Premium. In those Districts where the Honorary Silver Medal is offered for Bulls, Tenants cannot compete with the same animal both for the Honorary and the Money Premiums.

6. No member of the Committee shewing Stock of his own at the Competition shall act as judge; nor shall Factors, when they are members of the Society, and are named on the Committee, or when acting in the absence of Proprietors, be entitled to compete for the Money Premiums in those districts and classes in which Proprietors are excluded from Competition. It is recommended to the Committee to take the assistance of practical men as judges in awarding the Premiums. In all cases, the Bulls for which the Money Premiums are awarded, must have served, or shall be kept to serve, the District, for at least one season, at a moderate charge for each Cow, and the rate may be fixed by the Committee. The same person is not to obtain more than one of the Premiums for Bulls, nor more than one of the Premiums for Queys, in one year, except in those Districts where Tenants compete for the Honorary and Money Premiums for Bulls, in which case they may, with different animals, carry the Medal and one of the Money Premiums. While the Directors have deemed it expedient to exclude Proprietors and Factors named on the Committee, or acting in the absence of Proprietors, from competing for the *Money Premiums* in certain Districts where it is apprehended that the superiority of their Stock might discourage competition on the part of the Tenantry, they are fully impressed with the advantages of having such Stock exhibited at the District Shows, and have offered the Honorary Silver Medal of the Society for the best Bull exhibited at the Competition, should he be the property of one in that class, and superior to the Bull to which the highest Money Premium is awarded. A Bull which, as the property of a Proprietor, may have gained the Honorary Medal, will be allowed to compete in a future year for the highest Money Premium, when *bona fide* the property and in the possession of a Tenant, provided it should have continued the Proprietor's property for at least one year after the award of the Medal, and shall have afterwards been the Tenant's property and in his possession from the day fixed by the regulations (20th May). A Bull which may have been purchased by two or more Tenants for the use of their stocks will be allowed to compete, although the exhibitors may not be joint tenants.

7. In order to entitle the Competitors to their respective Premiums, a regular Report, signed by the Convener, and at least a majority of the Committee who attend the Competition, must be transmitted by the Conveners, so as to be received by the Secretary on or before the 10th of December next, and which Report must specify the ages of the Bulls and Queys preferred; the length of time the Bulls have been in the possession of the Competitors; and, with respect to the Queys, that they were bred by the Competitors, except in the 6th District, and were their property on the day of Competition; the number of Bulls and

Queys respectively produced thereat; the number placed for Competition in each Class; the names and designations of the Persons to whom the Premiums have been adjudged; amount of Premiums voted to each; and, in general, that all the Rules of Competition fixed by the Society, as above mentioned, have been strictly observed; and in particular, that the previous intimations to the Committee of Judges, and advertisements at the church-doors, were regularly made as required. In case all the Members of the Committee who may have attended shall not have subscribed the Report, the Convener will mention the cause which may have prevented their doing so.

Further, it is to be distinctly understood, that in no instance does any claim lie against the Society for expenses attending a Show of Stock, beyond the amount of the Premiums offered.

With reference to the Competitions in the 2d, 3d, and 6th Districts, the Reports must bear that the Bulls and Queys preferred were of the West Highland breed; in the 5th and 10th, of the Fifeshire breed; and in the 4th, 7th, 8th, and 12th, of the Aberdeen breed, the 4th being limited to the Polled Aberdeenshire. A portion of the Premiums in the 9th District is authorized to be assigned to stock of the Short-horn breed, and a portion to the Ayrshire breed.

Conveners are requested to get the Reports drawn up and signed by a majority of the Committee present at the Competition before they separate.

Note.—The Society gives the Premiums for three Competitions in alternate years; and provided the gentlemen of the District, or any Local Association therein, shall have continued the Competitions, and have awarded and duly reported Premiums in the District to an amount not less than one-half the Society's Premiums, and for the same description of Stock, during the two intermediate years, the Society continues its Premiums to the District for an additional year. By this arrangement, each district may have the benefit of six competitions. In Districts Nos. 1, 2 3, and 4, 1835 was the first year's competition; Local Premiums were awarded in 1836 and 1838, and this year they have the sixth or additional year's competition. In Districts 5 and 6, 1836 was the first year's competition; and this year these Districts have the Society's Premiums, which will be again given in 1841 to such of them as shall have awarded and reported Local Premiums in 1837 and 1839. In Districts Nos. 7, 8, and 9, 1838 was the first year's competition. In the Districts Nos. 10 and 11, this is the first year's competition for the Society's Premiums; they will be entitled to the Society's Premiums in 1842 and 1844, and also in 1845, if they award and report Local Premiums in 1841 and 1843. In the District No. 12, 1837 was the first year's competition; it had the Society's Premiums in 1839, and it will be this year open to the Local Premiums. In District No. 13, 1839 was the first competition for the Society's Premiums, and it will this year be open to the Local Premiums. If these two Districts award and report Premiums in the two intermediate years, they will have the Premiums for the additional year—No. 12 in 1842, and No. 13 in 1844. The Districts Nos. 14, 15, 16, and 17, are now offered for 1841 as the first year's competition, and the Premiums will be continued in 1843 and 1845, and if the Districts give Premiums in 1842 and 1844, the Society's Premiums will be again given in 1846. Farther, in order to encourage the Show for the Local Premiums, the Society, in those Districts in which the Honorary Silver Medal is offered, will continue it in the two intermediate years, under the same conditions as during the years when the Society's Premiums are given. A certificate of the Competition and Premiums awarded at the intermediate Local Shows in the several Districts, signed by at least two Members of the Society, must be transmitted to the Secretary of the Society, so as to be received by him on or before the 10th December in each year, in order to entitle the Districts to any claim for the additional year's Premiums.

§ II. WORK HORSES.

PREMIUMS FOR IMPROVING THE BREED OF DRAUGHT-HORSES.

1. *The Upper and Middle Wards of Lanarkshire.*
2. *The District of Kintyre, Argyllshire.*
3. *The Rhinns of Galloway, Wigtonshire.*
4. *The County of Ayr.*

In each of the above Districts, Twenty-five Sovereigns will be given by the Society, a sum not less than Twenty Sovereigns additional being given by the resident Gentlemen, or by Local Societies, for the improvement of the breed of Draught-Horses. The Premiums to be as follow:—

For the best Stallion, not under three years and nine months, and not exceeding twelve years old, kept exclusively for the improvement of the breed of Draught-Horses, within each of the said Districts, Nos. 1. and 2, and for this purpose to be shewn after the Premiums have been awarded, at such stations as may be fixed by the Conveners and Committee of Members of the Society resident in the respective Districts, for service of not more than seventy Mares, at a rate not exceeding One Sovereign for each, at such times between the 1st April and the 1st August 1840, as the respective Committees may fix, at meetings to be called by the Conveners for the purpose—Twenty-five Sovereigns.

For the best Mare for breeding Draught-Horses, not exceeding twelve years old, and which shall have had at least one foal, *bona fide* the property, and in possession of, any Tenant in each of the said Districts, Nos. 1. and 2, from 1st January 1839 to the day of Competition—Ten Sovereigns.

For the best entire Colt, not exceeding forty-five months old, *bona fide* the property of any Proprietor or Tenant in the said Districts, Nos. 1. and 2.—Ten Sovereigns.

NOTE.—The Premium to the best Stallion must be awarded under the condition, that the Prize Mare, and the Mare which shall be declared by the Judges next in merit, shall have a preference of Service by the Prize Stallion, free of charge; all the competing Mares to have a preference over other Mares to service by the Prize Stallion, on such terms and conditions as the Local Committee shall fix, but the charge in no case to exceed the sum indicated by the terms of the Premium. Evidence must be produced that the Prize Stallion has had produce.

RULES OF COMPETITION.

The time and place of Competition for the Premiums are to be fixed by the Conveners (the place of Competition for the first District to be within the Upper Ward) with the concurrence of at least a quorum of the Committee, and are to be published by the Conveners in due time at the church-doors, or in such other manner as shall be thought by them, and a quorum of the Committee, effectual for the information of those interested.

The Competition will take place in the 1st and 2d Districts betwixt 20th March and 1st May 1840, and in the 3d and 4th Districts within the same period in 1841. The regulations for Cattle Shows, in regard to fixing the competitions—the previous intimation to the Committee and Competitors—the recommendation to the Committee to take assistance of practical men as Judges—the power of the Committee to withhold the Premiums, if the animals produced shall be of inferior character—those relating to extra expenses, and against Competitors being also Judges—and the manner in which the Reports are to be certified and transmitted to the Society, are severally hereby declared applicable to the Premiums for Horses.

The Premiums now intimated are for the second Competition in the Districts Nos. 1 and 3, and for the first Competition in the Districts Nos. 2 and 4. The expediency of continuing the Premiums for another year in the two last-mentioned Districts is open for consideration, provided the Districts shall respectively propose again to guarantee a sum equal to what they now contribute.

The Members of the Society in the respective Districts are appointed Committees for regulating every thing relative to the Competitions, with power to name Sub-Committees of their number, for attending to the necessary details.

FOR THE FIRST DISTRICT—The Right Hon. Lord Belhaven and Sir Norman Macdonald Lockhart, Bart., or either of them, to be Conveners of the resident Members; in their absence, Mr Rennie Scott, Factor to Lord Douglas, to be Convener; three a quorum of the Committee.

FOR THE SECOND DISTRICT—Richard Campbell, Esq. of Auchinbreck, and John Lorn Stewart, Esq. of Glenbuckie, or either of them, to be Conveners of the resident Members; three a quorum of the Committee.

FOR THE THIRD DISTRICT—The Right Hon. the Earl of Galloway, in his absence Colonel Hunter Blair of Dunskey, C. B., to be Convener of the resident Members; three a quorum of the Committee.

FOR THE FOURTH DISTRICT—Sir Charles Dalrymple Fergusson of Kilkerran, Bart., and Archibald Hamilton, Esq. of Carcluie, to be Conveners of the Society's resident Members; three a quorum.

§ III. SHEEP AND WOOL.

PREMIUMS FOR IMPROVING THE BREED OF SHEEP IN THE FOLLOWING DISTRICTS.

1. *The Districts of Badenoch and Rothiemurchus, in Inverness-shire.*
2. *The Isle of Skye, in the County of Inverness.*
3. *The District of Cowall, Argyllshire.*

4. *The Districts of Morven, Ardnamurchan, Kingerloch, and Ardgower, Argyllshire.*
5. *The Parishes of Jedburgh, Southdean, Oxnam, Crailing, Hobkirk, Bedrule, Cavers, Morebattle, Yetholm, Hownam, Linton, and Eckford, in the County of Roxburgh.*

For the best six Tups of the Black-faced Breed, not exceeding four years old, the property of any Proprietor or Tenant in each of the said Districts, Nos. 1. and 4, which shall be certified at the Competition to belong to a flock of not less than 120 Ewes, and to have been no otherwise grazed or fed during the last season than the Exhibitor's Tups of the same age, and to have served the Ewes of the flock in the same manner, and at least for one month of the season—Eight Sovereigns.

For the second best six ditto—Five Sovereigns.

For the best six Tups of the Cheviot breed, not exceeding four years old, the property of any Proprietor or Tenant in the said District No. 4, certified as aforesaid—Eight Sovereigns.

For the best Pen of eighteen Gimmers or Ewes of the Black-faced breed, from sixteen to twenty months old, the property of any Proprietor or Tenant within each of the said two Districts Nos. 1. and 4, and which shall be certified at the Competition to have been at least one year in his possession, and to have been, during that year, grazed on the same kind of pasture with the remainder of the flock of the like age—Six Sovereigns.

For the second best Pen as aforesaid—Four Sovereigns.

For the best six Tups of the Cheviot breed, not exceeding four years old, the property of any Proprietor or Tenant in the said District No. 2, which shall be certified at the Competition to belong to a flock of not less than 120 Ewes, and to have been no otherwise grazed or fed during the last season than the Exhibitor's Tups of the same age, and to have served the Ewes of the flock in the same manner, and at least for one month of the season—Eight Sovereigns.

For the second best six ditto—Five Sovereigns.

For the best Pen of eighteen Gimmers or Ewes of the Cheviot breed, from sixteen to twenty months old, the property of any Proprietor or Tenant within the said District No. 2, and which shall be certified at the Competition to have been at least one year in his possession, and to have been, during that year, grazed on the same kind of pasture with the remainder of the flock of the like age—Six Sovereigns.

For the second best Pen as aforesaid—Four Sovereigns.

For the best six Tups of the Black-faced breed, not exceeding four years old, the property of any Proprietor or of any Tenant in the said District No. 3, paying *more than* L.150 of yearly rent, which shall be certified at the Competition to have been no otherwise grazed or fed during the last season than the Exhibitor's Tups of the same age, and to have served the Ewes of the flock in the same manner, and at least for one month of the season—Seven Sovereigns.

For the best six Tups of the Black-faced breed, not exceeding four years old, the property of any Tenant in the said last-mentioned District paying *not more than* L.150 of yearly rent, which shall be certified as aforesaid—Seven Sovereigns.

For the best Pen of eighteen Gimmers or Ewes of the Black-faced breed, from sixteen to twenty months old, the property of any Proprietor or of any Tenant within the said last-mentioned District paying *more than* L.150 of yearly rent, which shall be certified at the Competition to have been at least one year in his possession, and to have been, during that year, grazed on the same kind of pasture with the remainder of the flock of the same age—Five Sovereigns.

For the best Pen of eighteen Gimmers or Ewes of the Black-faced breed, from sixteen to twenty months old, the property of any Tenant within the said last-mentioned District paying *not more than* L.150 of rent, which shall be certified in the same manner as is required in the class last mentioned—Five Sovereigns.

For the best Tup, of any age, of the pure Cheviot breed, the property of any Proprietor or Tenant in the said District, No. 5, bred or bought by him, which shall have served in the District in the preceding season, or which shall so serve in the season following the competition—Seven Sovereigns.

For the best three two-year-old Tups, same breed, the property of, and bred by, any Proprietor or Tenant in the said District, No. 5.—Seven Sovereigns.

For the best pen of Five Shearling Tups, same breed, the property of, and bred by, any Proprietor or Tenant in the said District, No. 5.—Five Sovereigns.

For the best pen of Five Gimmers from the hill, same breed, the property of, and bred by, any Proprietor or Tenant in the said District, No. 5.—Five Sovereigns.

No person shall be allowed to compete in the said District, No. 5, whose stock consists of less than 120 ewes.

The following Members of the Society are appointed a Committee for awarding the Premiums :—

For the First District—Sir Joseph Radcliffe, Bart.; Sir George Macpherson Grant of Ballindalloch and Invereshie, Bart.; Ewen Macpherson, Esq. of Cluny; John Macpherson Grant, Esq. younger of Ballindalloch; James Evan Baillie, Esq. of Arnisdale; Colonel Duncan Macpherson; Major Macpherson of Glentruim; Allan Macpherson, Esq. Kingussie; Captain Eneas Macpherson, Nuidmore; Captain L. Macpherson, Biallidmore; Lieutenant Alexander Macpherson, Ruthven; *and any other Members in the district;* three a quorum.—Cluny Macpherson, in his absence Major Macpherson, Glentruim, to be Convener.

For the Second District—Lord Macdonald; Norman M'Leod, Esq. of M'Leod; Alexander Cumming, Esq. of Grishernish; Alexander Cumming, Esq. younger of Grishernish; John Elder, Esq. at Knock; Edward Gibbons, Esq. Factor to Macleod of Macleod; John Macleod, Esq. of Rasay; John M'Lennan, Esq. of Lynedale; Donald M'Caskill, Esq. Rhudanan; Alexander M'Donald, Esq. Tormore; Hugh M'Caskill, Esq. at Tallisker; Major Allan M'Donald, Esq. of Waternish; Hugh P. M'Donald, Esq. at Moukstad; Alexander K. M'Kinnon, Esq. at Corry; Dr Farquhar Mackinnon, at Kyle; Rev. John Mackinnon of Strath; Martin Macleod, Esq. at Drynock; William Macleod, Esq. of Orbost; Charles Shaw, Esq. Factor to Lord Macdonald; *and any other Members resident in the District;* three a quorum.—Lord Macdonald and Norman Macleod, Esq. of Macleod, Conveners; in their absence, their Factors are authorized to act.

For the Third District—James Henry Campbell, Esq., Ardkinlas; John Campbell, Esq. of Strachur; John Campbell, Esq. of South Hall; Mungo N. Campbell, Esq. of Ballimore; Archibald Campbell, Esq. of Glendaruel; John Campbell, Esq. of Ormidale; Alexander Campbell, Esq. of Monzie; William Campbell, Esq. of Dunoon Castle; Archibald Douglas, Esq. of Glenfinart; Kirkman Finlay, Esq. of Castle-Toward; Angus Fletcher, Esq. of Dunans; James Hunter, Esq. of Hafton; Alexander Lamont, Esq. of Knockdow; Robert Maclachlan, Esq. of Maclachlan; John Macarthur Moir, Esq. of Milton; Lieutenant M'Nicol, Glenbranter; George R. Wilson, Esq. of Benmore; *and any other Members resident in the District;* three a quorum.—Robert Maclachlan, Esq. of Maclachlan, in his absence Alexander Lamont, Esq. of Knockdow, Convener.

For the Fourth District—Sir James Milles Riddell, Bart., in his absence John Gregorson, Esq. of Ardtornish, to be Convener of the Committee of resident Members named in the advertisement of last year.

For the Fifth District—Lord Douglas, in his absence Mr Scotland, his Lordship's Factor, to be Convener of the Society's resident Members. The Committee for this District will be named in 1841.

RULES OF COMPETITION.

The Competition for the Premiums in the first three Districts will take place on such days between the 1st of June and the 1st of November 1840, as shall be fixed by the Convener, with the advice of a quorum of the Committee. In the fourth District, the Competition will take place at Strontian, within the same period in 1841.

It is recommended to the Committee, as in the case of Cattle Competitions, to take the assistance of practical men as Judges in awarding the Premiums. The Judges,* in deciding the Premiums for Sheep, will have regard both to the wool and carcass of the animal. The regulations for Cattle Shows, in regard to the previous intimations to Judges and Competitors—the placing of the Stock, and the number of Competitors required for Competition—the power to make provisionally an allowance for Stock of merit in the event of deficiency in number, and prohibiting Members acting as Judges who are also Competitors—the regulations relating to extra expenses—and the manner in which the Reports are to be certified and transmitted, are severally hereby declared to be applicable to the Premiums for Sheep.

The Note annexed to the Rules of Competition for the Premiums for Cattle is also applicable to the Premiums for Sheep, which will be continued by the Society for an additional period, in the several Districts, on the conditions specified in the said Note. In the first District this is the third year's Competition, and it will be entitled to the fourth or additional year's Premiums in 1841, the District having awarded Local Premiums in 1837 and 1839. In the second and third Districts, 1840 is the first year's Competition. They will have the Society's Premiums again in 1842 and 1844; and if they award Local Premiums in 1841 and 1843, they will have the additional year in 1845. In the fourth District, 1841 will be the third year for the Society's Premiums, and they will have the additional year in 1842, if they shall have awarded Local Premiums in 1833 and 1840. In the fifth District, 1841 will be the first Competition. It will have the Society's Premiums again in 1843 and 1845; and if the District award and report Local Premiums in 1842 and 1844, it will have the additional year from the Society in 1846.

The Society being desirous to promote the improvement of the several breeds of Sheep considered most suitable for the various localities of Scotland, the Directors take this mode of intimating, that they will be disposed to receive favourably applications for an increased number of Districts for Premiums to be offered for Sheep.

WOOL.

The following Premiums are offered to be awarded at the Perth Wool Fair in 1840:—

1. For the best sample of Leicester Wool, shown by the breeder of the stock, and consisting of not fewer than seven fleeces—Five Sovereigns.

2. For the best sample of Cheviot Laid Wool, shown by the breeder of the stock, and consisting of not fewer than seven fleeces—Five Sovereigns.

3. For the best sample of Black-faced Laid Wool, shown by the breeder of the stock, and consisting of not fewer than seven fleeces—Five Sovereigns.

Competitors for these Premiums are required to state the number of Sheep of which the Flock consisted from which the sample is taken; the gross quantity clipped; whether the fleeces are Ewe or Hog; and, if sold, the price obtained. There must be at least three Competitors for the particular description of Wool, to authorize the award of the Premium. In deciding the Premiums, it is recommended to take the assistance of Practical Farmers.

The Society's Members resident in the neighbourhood of the place of competition to be a Committee for attending to all arrangements necessary. Sir John S. Richardson, Bart. of Pitfour, in his absence Archibald Turnbull, Esq. of Bellwood, Secretary to the Perth Agricultural Society, to be Convener. The Report of the Competition to be transmitted to the Society on or before the 10th of November 1840.

Similar Premiums will be given at the Inverness Wool Fair in 1841.

§ IV. SWINE.

PREMIUMS FOR IMPROVING THE BREED OF SWINE.

1. *The Islands of Orkney.*
2. *The District of Fettercairn, Kincardineshire.*

For the best Boar, not under twelve months, and not exceeding four years old, *bona fide* the property and in possession of any Proprietor or Tenant in the first District, in autumn 1840—Five Sovereigns.

For the second best—Three Sovereigns.

For the best Breeding Sow of the same age—Four Sovereigns.

For the second best—Two Sovereigns.

These Premiums to be awarded for animals that are considered most profitable and best suited for the purpose of curing mess Pork. Attention is recommended to the introduction of the Berkshire or Suffolk breed of Swine, as being the best for curing Pork.

Similar Premiums will be given in the second District in 1841.

provided the resident Gentlemen, or any Local Association, award, in 1840, premiums for the same description of stock, and to an amount not less than one-half of that which was given by the Society in 1839.

The Competitions are to be held at such times and places as the Society's Members resident in the Districts shall fix at a meeting to be intimated by the respective Conveners for the purpose. This meeting is also authorized to name a Committee for managing all details, and to fix the necessary regulations for competition. A Report of the award of the Premiums, with a copy of the Regulations of Competition, to be transmitted to the Secretary on or before the 10th of December 1840 for the First District, and by the same date in 1841 for the Second District.

FOR THE FIRST DISTRICT.—James Baikie, Esq. of Tankerness; in his absence, Charles Sheriff, Esq., Sheriff-substitute of Orkney, to be Convener.

FOR THE SECOND DISTRICT.—The Right Hon. Viscount Arbuthnot; in his absence, Sir John Stuart Forbes of Pitsligo and Fettercairn, Bart., to be Convener.

CLASS VII.

PRODUCTS OF LIVE STOCK.

§ I. CURING BUTTER.

DISTRICTS.

The Island of Mull, the Districts of Ardnamurchan, Morvern, Kingerloch, and Ardgower, in the County of Argyll.

The Premiums given, and regulations suggested, for promoting an improved system of Curing Butter, having been productive of highly satisfactory results, the following Premiums are offered in the above District in 1841:—

To the owner of any Dairy in the said District who shall make and cure the best quality of Butter for the market, not being less than one cwt. (112 lb. the cwt. and 16 oz. the lb.) during the season 1841—Six Sovereigns.

For the second best quality as aforesaid—Four Sovereigns.

For the third best quality as aforesaid—Three Sovereigns.

For the fourth best quality as aforesaid—Two Sovereigns.

CONDITIONS.

The Butter must be certified to have been made and cured on the Competitor's farm during the season 1841; and the whole quantity produced at the Competition must not be less than one cwt. The Certificate must be supported by the declaration of the Exhibitor. The butter shall be inspected by a Committee of the Members of the Society resident within the district. The Committee, at any meeting to be called by the Convener for that purpose, shall fix such general regulations as they may consider proper; and they will, in particular, fix the place and day of Competition. The quality of the Butter to be tested by judges to be named by the Committee, in the way usually done by purchasers in the public market. In the event of two or more competing lots being deemed equal in quality, the Premium will be awarded to the larger quantity. Although not required as a condition, it is strongly recommended, as affording facilities for sales, that the Butter should be packed in firkins containing 56lb. each, or in earthen vessels which have not been glazed with preparations of lead, and of such size as may be suitable for sales. The successful candidates, before receiving the Premiums, are required to transmit to the Secretary a detailed report of the whole process followed by them in the manufacture of their Butter. Reports of the award of the Premiums to be lodged with the Secretary of the Society, on or before the 10th December 1841.

Colonel Maclean of Ardgower, in his absence Colonel Campbell of Possil, to be Convener of the Society's resident members.

2. MAKING CHEESE.

The Society having for a series of years given Premiums in the Dairy Districts of Scotland for the most approved descriptions of Cheese, with results highly satisfactory, specimens, at remunerating prices, having been produced of superior quality, of the finer descriptions of Cheese, it has been resolved to give further encouragement to bring forward superior Cheese, by offering Premiums open to all Scotland as follows:

PREMIUMS.

1. For the best Cheese of the quality denominated Double Gloucester—Eight Sovereigns, or Plate of that value.
2. For the best Cheese of the quality denominated North Wiltshire—Eight Sovereigns, or Plate of that value.
3. For the best Cheese of the quality denominated Cheshire—Eight Sovereigns, or Plate of that value.
4. For the best Cheese of the quality denominated Stilton—Eight Sovereigns, or Plate of that value.
5. For the best Cheese made from Skim Milk—Eight Sovereigns, or Plate of that value.
6. For the best Cheese of any variety differing in taste and flavour from the kinds above specified, and not of the description denominated Dunlop, the manufacture of which is sufficiently known—Eight Sovereigns, or Plate of that value.

CONDITIONS.

The several varieties above mentioned to be made in 1841, with the exception of Classes 3 and 4 (Cheshire and Stilton), which must be made in 1840. Intending Competitors must lodge, with any Member of the Society in their neighbourhood, before the 1st of June 1841, a memorandum specifying the description or descriptions of Cheese for which they intend to compete, and the quantity must not be less than 1 cwt. of any variety. Each competitor must lodge with the Secretary at the Society's Hall, on or before the 10th of December 1841, specimens of the Cheese for which he is to compete, of not less than 16 lb. imperial weight, in not more than two cheeses, accompanied by a declaration that the specimens are fair average samples of the whole cheese made by the competitor during the season, of the description for which he competes. In Class 5 the declaration must bear that neither creamed nor uncreamed milk has been used, and that the milk had not stood less than twelve hours before the cream was taken off. The declaration in the several classes to be sealed, and to bear upon the envelope a motto or mark corresponding to the distinguishing mark upon the cheese, to which it has reference.

The successful Competitors before receiving payment of their premiums shall, if required, transmit to the Society a detailed report of the whole process employed by them in the manufacture of their cheese.

The parties who gained the Premiums in Classes 1, 2, 5, and 6, at the Competitions in Edinburgh in 1838 and 1839, will not be allowed to compete for the Premiums now offered in these Classes.

Members of the Society, to whom intimation may be given by intending competitors, are particularly requested to visit the dairies, and to report upon them, and particularly upon the progress made in cheese-making in general in their district since the Society first directed attention to this important object.

CLASS VIII.

COTTAGES.

1. PREMIUMS FOR THE BEST KEPT COTTAGES AND GARDENS.

In order to encourage Cottagers to keep their cottages and gardens neat and clean, the following Premiums will be given in the parishes after mentioned.

Lanarkshire.

PARISH OF CULTER.—Convener, Adam Sim, Esq. Coultermains.

PARISH OF AVONDALE.—Convener, George Alston, Esq. of Muirburn.

THE PARISH OF CARLUKE,—Convener, William Lockhart, Esq. of Milton-Lockhart.

THE PARISH OF DALSERF.—John Hamilton, Esq. of Fairholm.

Fifeshire.

PARISH OF KINGHORN.—Convener, the Earl of Rosslyn.

PARISH OF SCOONIE.—Convener, Major Anderson of Kingask.

PARISH OF MARKINCH.—Convener, John Balfour, Esq. of Balbirnie.

PARISH OF KENNOWAY.—Convener, J. B. Fernie, Esq. of Kilmux.

Mid-Lothian.

PARISH OF CARRINGTON.—Convener, the Earl of Rosebery.

PARISH OF CURRIE.—Convener, William Gibson-Craig, Esq. yr. of Riccarton, M.P

PARISH OF LIBERTON.—Convener, Richard Trotter, Esq. of Mortonhall.

PARISH OF STOW.—Convener, John Borthwick, Esq. of Crookston.

Selkirkshire.

PARISH OF SELKIRK.—Convener, Alex. Pringle, Esq. of Whytbank, M.P.

PARISH OF ROBERTON.—Convener, Thomas Stavert, Esq. of Hosecoat.

PARISH OF ETTRICK.—Convener, William Ogilvie, Esq. of Chesters.

PARISH OF YARROW.—Convener, Major-General Sir James Russell of Ashiestiel, C.B.

East-Lothian.

PARISH OF NORTH BERWICK.—Convener, Sir George Grant Suttie, Bart.

PARISH OF PRESTONKIRK.—Convener, Sir Thomas Buchan Hepburn, Bart. M.P.

PARISH OF ATHELSTANEFORD.—Convener, Sir David Kinloch, Bart.

PARISH OF TYNINGHAME.—Convener, the Earl of Haddington.

The Islands of Zetland.

PARISH OF BRESSAY.—Convener, Captain Cameron Mouat of Garth.

PARISH OF NORTHMAVING.—Convener, Henry Cheyne, Esq. yr. of Tangwick.

County of Caithness.

THE PARISH OF WICK.—Convener, Robert Innes, Esq. of Thrumster.

THE PARISH OF THURSO.—Convener, Captain Henderson of Brabsterdorran.

PREMIUMS.

1. For the best kept Cottage in each of the said parishes—Two Sovereigns.

2. For the second best kept ditto—One Sovereign.

3. For the best kept Cottage-garden in each parish—One Sovereign.

CONDITIONS.

The names of intending Competitors must be intimated to the Conveners appointed by the Society, on or before the 20th of April next, otherwise they shall not be allowed to compete. The inspection of the *Cottages* and *Gardens* to take place between 12th June and 12th August. And, in making the inspection, the Conveners shall have power to take the assistance of any of the Members of the Society, or of any competent judge.

In order to authorize the awarding of the Premiums, the annual value of the Cottage of the Competitor, with the ground annexed, must not exceed £5 sterling, and there must at least be two Competitors in the District. No Cottage or Garden for which a Premium has been awarded by the Society, will be admitted in competition again for the same or a lower premium. If the Cottage competing is occupied by the Proprietor, the roof must be in good repair. If the roof is of thatch, it must be in good repair, though in the occupation of a tenant. The windows must be free of broken glass, and perfectly clean, and must afford the means of ventilation. Dunghills and all other nuisances must be removed from the front and gables. The peat-stacks, if any, must be so placed as not to be a deformity; and the interior of the Cottage must be as cleanly kept as the nature of the Cottage admits of. In awarding the Cottage Premiums, the preference will be given to those who, in addition to these requisites, have displayed the greatest taste in ornamenting the exterior of their houses, with the ground in front and at the gables.

In estimating the claims of Competitors for the Garden Premium, the Judges will have in view, 1st, The sufficiency and neatness of the fence; 2d, The cleanness of the ground, and neatness of the walks; 3d, The quality of the crops, and general productiveness of the Garden; and 4th, The choice of crops. Much advantage is derived in some districts in Scotland from Cottagers cultivating, besides the more common crops, a portion of early potatoes along with the late, of early cabbage, early pease, cauliflower, lettuce, with some gooseberry and currant bushes, and a fruit-tree trained against the wall, &c.

Reports stating that the various particulars before mentioned have been attended to, the number of Competitors, the names of the successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary of the Society, on or before the 1st day of September next.

Similar Premiums will be given for four successive years in four parishes in each of any two counties, according to priority of application, on condition that a satisfactory guarantee for one-half of the amount of the Premiums to be given, shall be lodged by each parish with the Secretary, on or before the 1st of January 1841. The Premiums for these Counties will be competed for in that and three following years. If the guarantees shall be lodged from more than four parishes in any of these Counties, within the time limited, the preference will be given to those which have been first received. If guarantees shall not be lodged within the above period from four parishes in the same county, the Directors will then consider such applications as may be made to them from other parishes, and confer the like privileges upon such a number of them as to make out the entire amount of eight new Districts.

2. PREMIUMS TO PROPRIETORS FOR BUILDING COTTAGES.

1. *The County of Perth.*
2. *The County of Ayr.*

In order to mark the sense which the Society entertains of the advantages likely to result to the country, by Landed Proprietors exerting themselves to improve the style and comfort of Cottages on their estates; and in order to call the attention of such Proprietors to the subject, the Society proposes to give Premiums as undermentioned.

1. To the Proprietor who shall have erected on his estate, dur-

ing the year 1840, the best and approved Cottage—The Honorary Silver Medal.

2. To the Proprietor who shall erect on his estate, during the years 1839, 1840, 1841, and 1842, the greatest number of approved Cottages—The Gold Medal.

The claims of intending Competitors for the Premium No. 1, must be lodged with the Conveners of the Committee of the Society in the said Counties, on or before the 1st of October, otherwise they shall not be entitled to compete; and for the Premium No. 2, in the same manner, on or before the 1st of October in the year 1842. The inspection of the Cottages to take place between the 1st October and the 1st November for the Premium No. 1, and between the same dates in the year 1842, for the Premium No. 2.

Reports by the Conveners to be transmitted to the Secretary of the Society on or before the 30th of November in each year.

In order to authorize the award of the Premiums, the annual value of the Cottage or Cottages separately, with garden-ground, must not exceed L.5 Sterling; and in awarding the Premium No. 2, the Cottage for which the Premium No. 1 has been awarded, shall be deducted from the number.

In estimating the claims of Competitors, the following points will be kept in view:—1st, The situation of the Cottage with reference to amenity of climate and aspect, and to the means of drainage and of preserving cleanliness. 2d, The suitableness of the structure to withstand the effects of the climate of the district. 3d, The accommodation in the interior of the Cottage, and the arrangement of out-houses attached to it. 4th, The small expense of the building compared with its durability, and with the accommodation afforded, and calculated with reference to the price of materials, and other circumstances, which may vary in different districts. 5th, The outward appearance of the Cottage or Cottages.

Parties competing to forward plans, specifications, and statements, to the Society, through the Conveners of the Districts, from which, and of all information sent therewith, copies may be taken for publication, if the Society shall see fit, and the originals returned to the parties within six months, if desired.

The Members of the Society in the respective Counties, or in the neighbourhood of the Cottages competing, are appointed Committees to inspect the Cottages, and report on the claims, with power to name Sub-Committees.

FOR THE FIRST DISTRICT.—Sir Neil Menzies of Menzies, Bart., Honorary Secretary of the Society, and Patrick Small Keir, Esq. of Kinmonth, to be Conveners.

For the Second District.—Sir Charles Dalrymple Fergusson of Kilkerran, Bart., and Archibald Hamilton, Esq. of Carcluie, Rozelle, to be Conveners.

Note.—If the Society find the Premiums practically useful and generally approved of, they will hereafter be extended to other Counties.

3. COTTAGE WINDOWS.

The Windows in general use for Cottages being expensive, and otherwise objectionable,

Ten Sovereigns will be given for the best and approved Cottage Window.

The design must combine economy in the construction; efficiency in excluding rain, &c.; afford easy means of ventilation; and admit of repair with glass of the proper dimensions, furnished without the assistance of experienced tradesmen. Competitors to state the price at which they will supply the windows to the public.

A specimen of the window proposed, with a statement of the necessary particulars, to be lodged with the Secretary of the Society, on or before the 1st of September 1840.

4. USE OF THE SPADE.

The Society, with the view of promoting dexterity in the use of the Spade, particularly in those parts of the country where there is a redundant population, without the means of sufficient employment, will give Premiums to the amount of Two Sovereigns in each of eight parishes, for four successive years, provided a satisfactory guarantee from each parish for the application of an equal sum to the same purpose shall be lodged with the Secretary on or before the 15th of May next. The first eight Parishes lodging the guarantees to be preferred. These sums to be divided as follows:—

For the best specimen of Spade Work in each of these parishes, in a Competition, where not fewer than 15 Competitors have appeared—the sum of L.1, 10s.

For the second best, L.1, 5s.

For the third best 15s. And

For the fourth best 10s.

The time and place of these Competitions to be fixed by the Convener, who, with the assistance of such other Members of the Society as may attend, shall decide the Premiums. The Competitions must take place on or before the 11th of November, in the years 1840, 1841, 1842, and 1843, and be reported on or before the 1st of December following.

Persons having gained first Premiums, to be excluded from competing in future years.

> **Note.**—The Convener shall have full power to fix the quantity of ground to be turned over, the depth, and the duration of the Competition, and all other necessary arrangements.

5. MEDALS TO COTTAGERS.

In the view of giving still farther encouragement to Cottagers of the description referred to under the first branch of this Class, who do not reside in Parishes in which the regular Premiums are in operation, and at the same time of giving aid to Local Associations and public-spirited individuals, establishing or continuing at their own expense Premiums for the like objects, the Society will give its Cottage Medal to such Associations or public-spirited individuals as apply for the same, and may be desirous to add that testimony of approbation to such Premiums as they themselves bestow. The number of Medals to be issued annually is limited to six.

> Applications for these Medals, stating the nature and amount of the encouragement which is to be afforded by the parties applying, to be made to the Society on or before the 1st of July in each year, so that the Association or individual making the application may be enabled to intimate that the Medals are to be given. The Medals will afterwards be issued upon a Report, certified in the terms required by the preceding conditions, describing the merits of the Cottagers. The Reports to be lodged with the Secretary before the 10th November of the year in which the application is made.

6. PREMIUMS TO COTTAGERS FOR PROMOTING ATTENTION TO THE CULTIVATION AND MANAGEMENT OF BEES.

1. *The Counties of Ayr and Wigton.*
2. *The County of Dumfries and the Stewartry of Kirkcudbright.*

To the Cottager in the 1st District, paying L.5 of rent or under, or whose cottage and land annexed to it does not exceed that annual value, who, between the 1st of June and 1st October 1840, shall have raised the greatest number of Hives of Bees, not fewer than seven, from stocks of his or her own property, none of the hives weighing under 20 lb. exclusive of the weight of the material of the hive or skep—A Premium of Four Sovereigns.

To the Cottager in the same District who shall have raised the second greatest number as aforesaid—Three Sovereigns.

To the Cottager in the same District who shall have raised the third greatest number—Two Sovereigns.

To the Cottager in the same District who shall have raised the fourth greatest number—One Sovereign.

Certificates of the number of Hives, and their several weights, making allowance for the weight of the skeps (which must be weighed before being used), signed by two Members of the Society resident in the neighbourhood, or by one Member and the Clergyman of the Parish, to be transmitted to the Secretary on or before the 10th November 1840.

Similar Premiums will be given in the Second District for Hives raised between the 1st June and 1st October 1841.

CONVENERS FOR AYRSHIRE.—Sir Charles D. Fergusson of Kilkerran, Bart., and Archd. Hamilton, Esq. of Carcluie.

CONVENERS FOR WIGTONSHIRE.—Colonel Hunter Blair of Dunskey, C. B., in his absence, Mr Murdoch, Dinvin.

In order that the Premiums offered may be made known to the industrious Cottagers, the Society trusts much to the obliging co-operation of the Clergy in the Counties in which the Cottage Premiums are offered.

CLASS IX.

WOODS AND PLANTATIONS.

1. HONORARY PREMIUM FOR EXTENSIVE PLANTING.

To the Proprietor who shall, within a period of five years immediately preceding, have planted on his property the greatest extent of ground, not being less than 300 acres, and who shall communicate to the Society, on or before the 10th of November in any year, a satisfactory report of his operations, embracing the expense, description of soil, age, and kind of trees planted, the number of each sort per acre, mode of planting, extent of "beeting up," and general progress of the plantation, with such observations as his experience may suggest—The Gold Medal.

2. REPORTS ON RECENT PLANTATIONS.

To the Proprietor who shall communicate to the Society, on or before the 10th of November in any year, the most satisfactory Report on the Planting of Land, founded on experiment; and who shall, accordingly, have planted on his own property an extent of not less than fifty acres, within a period of not more than ten nor less than four years preceding the date of his Report—The Gold Medal.

The Report should comprehend every interesting particular; among others, the exposure and altitude of the place, and general character of the soil—the mode of fencing and of planting adopted—the kind of trees planted, and the number of each kind per acre—their relative progress—the proportion of blanks or deaths at the end of three years—the state of the plantations at the date of making the report—and the expense per acre, as nearly as can be calculated.

3. NATIVE FIR WOODS.

For the best and approved account of any of the Districts of Scotland where the *Pinus sylvestris* is indigenous, and abounds so as to constitute a native forest.—The Gold Medal or Plate of the same value.

The Society has already received a Report on the Glenmore, Duthill, Rothiemurchus, and Abernethy Forests, which has been published in its Transactions. Competitors will avoid giving the same information as is there contained. No Report has been received on the Pine Forests of Aberdeenshire.

It will be expected that a view should be given both of the past and present state of the woods to which the Report has reference, and of the nature of the situations, and of the *soil* and *subsoil* where the trees appear to thrive best. It will be desirable also that measurements of some of the largest trees should be given, and a statement of their age, as far as it can be ascertained, by counting the rings or annual layers on felled trees of similar dimensions. Sections of the timber to be transmitted with the Report. The comparative growth of any other native trees which occur in the District, such as Birch or Oak, should be mentioned, and the undergrowth and general state of the pasture herbage should be described. Any circumstances which may appear to the writer likely to throw light on the growth and management of native fir woods, should be adverted to, and, in particular, how far the observation is well founded, that the best trees have a northern exposure, or are found in woods, having a north aspect or inclination.

4. PLANTATIONS OF PINUS SYLVESTRIS IN SCOTLAND.

For the best and approved Report of the Plantations of *Pinus sylvestris* in any District in Scotland—Ten Sovereigns, or Plate of that value.

It is required that the Report shall embrace a considerable District of country, and that at least two separate plantations, on different soils or exposures, be reported on, containing not less than one hundred imperial acres, and consisting of useful sized timber, not less than forty years old; the mode of planting and after management (so far as the reporter may be enabled to ascertain the same) to be stated, as well as the return which the thinnings, &c. may have already yielded; also the yearly value of the ground before planting; together with the present value and condition of the trees and pasture.

It is further especially required, that the Reporter describe minutely the nature of the soil and subsoil, also enumerate the plants forming the natural herbage; and should any difference exist in the health and quality of the trees in different parts of the plantations, a statement of the supposed causes producing such will be necessary. Transverse sections at least six inches in depth, of the different qualities of the timber to be lodged with the Reports, which are to be lodged by the 20th of October 1840.

5. COLLECTING THE SEEDS OF THE SCOTS FIR OR PINUS SYLVESTRIS FROM NATIVE TREES IN SCOTLAND.

To the person in Scotland who shall, between 30th October 1836 and 30th October 1840, have collected and sown, or sold for sowing, the greatest quantity of seeds of the Scots Fir or *Pinus sylvestris*, from healthy and free-growing trees of natural growth in the Highland Districts of the Counties of Aberdeen, Moray, Inverness, or Perth, the quantity to be not less than 1500 lb. clean seed—The Gold Medal, or a piece of plate of that value.

Competitors to transmit to the Secretary of the Society, on or before the 10th of November 1840, a declaration in support of the collection of the seed from proper trees, specifying the quantity collected in each year, and the district where it was gathered, stating also whether the seed had been sown or sold, and in the latter case the name of the purchaser. The expense of collecting, and, if sold, the price obtained, should likewise be reported.

6. IMPORTING THE SEEDS OF THE PINUS SYLVESTRIS, COLLECTED FROM TREES IN THE NATIVE FORESTS OF THE CONTINENT.

To the person in Scotland who shall, between the 30th October 1836 and 30th October 1840, have imported from Germany or Switzerland, or from Norway, Sweden, or Russia, and sown, or sold for sowing, the largest quantity of the seeds of the *Pinus sylvestris* (Kiefer, or Föhre, Röför), taken from full-grown healthy trees in those countries, but in no case from trees situated in the immediate vicinity of the sea, the quantity not to be less than 1500 lbs. of clean seed—The Gold Medal, or a piece of Plate of the same value.

Competitors to transmit to the Secretary of the Society, on or before the 10th of November 1840, evidence (the best that can be obtained) in support of the collection of the seed from proper trees, specifying the District where it was collected, and the commercial firm through whose means it was imported; also whether it had been sown in this country by the importer, or sold for that purpose, and, in the latter case, the name of the purchasers. The cost price, and, if sold, the price obtained, to be also stated.

7. INTRODUCTION OF NEW AND EXTENDING THE CULTIVATION OF THE RARER USEFUL FOREST-TREES IN SCOTTISH PLANTATIONS.

To the person who shall, on or before the 30th October in any year, report to the Society the successful introduction into Scottish Plantations, of any new ornamental or useful Forest-Tree, or the successful extended cultivation of any of the rarer useful sorts already known, but which have not hitherto received the attention which their merits would warrant—The Silver Medal, or a piece of Plate of such value as the communication may be adjudged to deserve.

Attention is more particularly directed to such trees as will grow in situations unfavourable to the health of the more generally known sorts, as elevated mountains, peaty and sandy tracts, exposed marine situations; and, in regard to the last of these, it is especially wished to ascertain the value of the *Pinus pinaster*, or the *Pinus maritima major* of the French.

Satisfactory evidence will be required, that the tree reported upon is of new or recent introduction, or that it has not hitherto received that extended cultivation which, from its value, it may have merited; and that the soil and situation for which it is recommended are congenial to its habits. A particular account of its nature and habits, nursery, and after management, uses and value of its timber, or effect in landscape scenery; and, if new, an account of its introduction must be furnished, accompanied by a specimen of the branches and foliage, and if possible, a specimen of the wood, and also of its fruit.

8. INTRODUCTION OF FOREST-TREES NOT YET KNOWN IN A LIVING STATE IN SCOTLAND.

To the person who shall, in any year, transmit to the Society, in a state fit for germination, seeds of Forest-Trees not yet in cultivation in this country, and which are natives of such places as, from their latitude or altitude, may be expected to produce trees hardy in the climate of Scotland—The Gold or Silver Medal, or a piece of Plate of such value as the Directors, in the circumstances of the case, may think suitable.

The Society would particularly wish to direct (but by no means to confine) attention to the Fir Tribes; and the countries from which contributions are particularly expected are the north-west part of America, the table-land of Mexico, such parts of the Andes as have sufficient elevation, and the Himalaya Mountains, or the great plains to the northward of them. The seeds may be sent home in the cones, wrapped in brown paper, packed in a box, and kept in a cool airy part of the cabin, but by no means in the hold, nor in close tin cases. If Competitors possess the means, by themselves or their correspondents, of trying their vegetation in this country, it will be desirable that they should do so; but otherwise, if the seeds be sent to the Secretary of the Society, they will be tried under the direction of the Society, so as to afford every chance of success. The transmission of living plants in boxes, or in cases covered with glass, may be attempted where practicable; the external air should be excluded, and almost no water given during the voyage. Where this plan is adopted, smaller seeds, berries, or heps, may be thickly mixed with the soil or earth in which the plants are placed.

9. MORE EXTENDED INTRODUCTION OF KNOWN SPECIES OF THE FIR TRIBE.

To the person who shall, within five years from 1835, inclusive, have introduced from any part of the world, Cones containing seeds capable of germination, the produce of hardy species of the Fir Tribes which have been already introduced into Britain, but of which only a few plants have been raised—The Gold or Silver Medal, or a piece of Plate of such value as the Directors may, in the circumstances of the case, deem adequate.

It is required that the quantity of cones of each species imported shall be sufficient to afford at least 500 seedling plants; and farther, that before the premium be awarded, the number of seedling plants of each species actually raised in Scotland, shall not be less than 100. Attention is particularly directed to Araucaria imbricata, Pinus ponderosa, Lambertiana, and Sabiniana; to Abies Douglasii, nobilis, grandis, and Menziesii; and to Taxodium sempervirens, which last is abundant in the vicinity of St Francisco, and throughout the low sandy plains of California. Reports to be lodged by 10th November 1841.

CLASS X.

GENERAL SHOW OF LIVE STOCK,

AND

AGRICULTURAL MEETING AT ABERDEEN IN 1840.

The Society having resolved to hold the General Show of Live Stock and Agricultural Meeting for 1840 at Aberdeen, the following Premiums are offered to be then awarded, aided by liberal donations from the Counties of Aberdeen, Forfar, Kincardine, and Banff, and from the city of Aberdeen. The Competition will be open to Stock from any part of the United Kingdom.

§ I. CATTLE.

SHORT-HORN BREED.

CLASS I. For the best Bull, calved after 1st January 1835—Twenty-five Sovereigns.

For the second best do., of same age—Fifteen Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

It is a condition attached to the above Premiums, that the Exhibitors shall be obliged to let out the Prize Bulls to serve in such locality of the four counties, during the season 1841, as the Local Committee shall fix. The party claiming the service must guarantee to the owner of the Bulls a payment of Twenty Guineas, and the expense of taking the animals to the places appointed, and the expense of their keep. The owner, if resident in the District, to have a preference of service for his own Stock.

II. For the best Bull, calved after 1st January 1839—Ten Sovereigns.

For the second best do.—Five Sovereigns.

III. For the best Cow of any age—Ten Sovereigns.

For the second best do.—Seven Sovereigns.

NOTE.—It has been intimated by a Member of the Society, that he has induced a celebrated English Breeder to promise to send a Short-horn Cow to the Aberdeen Show, which, the Breeder states, will beat all Scotland. The Member referred to has promised, that if any Member of the Society brings forward a Cow on that occasion, which shall be preferred to the Cow of the said English Breeder, and gain the first prize, he will add Fifty Sovereigns to the Society's Premium for the best Short-horn Cow, on condition that the said Cow shall be kept in Scotland so long as she is useful as a breeder. The gentleman, of course, guards himself against the possibility of the English Cow not being brought forward, owing to any accident or circumstance over which he has no control.

IV. For the best Heifer, calved after 1st January 1838—Seven Sovereigns.

V. For the best do., calved after 1st January 1839—Seven Sovereigns.

VI. For the best two Oxen, calved after 1st January 1837—Ten Sovereigns.

ABERDEENSHIRE HORNED BREED.

VII. For the best Bull, calved after 1st January 1834—Fifteen Sovereigns.

For the second best do., calved after 1st January 1834—Ten Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

A similar condition as in Class I. The guarantee to be Ten Pounds.

VIII. For the best Cow of any age—Ten Sovereigns.

For the second best do.—Five Sovereigns.

IX. For the best Ox, calved after 1st January 1836—Ten Sovereigns.

X. For the best Ox, calved after 1st January 1837—Seven Sovereigns.

ABERDEEN, ANGUS, AND GALLOWAY POLLED BREEDS.

XI. For the best Bull, calved after 1st January 1834—Fifteen Sovereigns.

For the second best do.—Ten Sovereigns.

For the third best do.—Seven Sovereigns.

To the *Breeder* of the best Bull in this class—the Honorary Silver Medal.

The same conditions as in Class VII.

XII. For the best Cow of any age—Ten Sovereigns.

For the second best do.—Seven Sovereigns.

For the third best do.—Five Sovereigns.

XIII. For the best Heifer, calved after 1st January 1838—Seven Sovereigns.

For the second best do.—Five Sovereigns.

XIV. For the best Heifer, calved after 1st January 1839—Seven Sovereigns.

For the second best do.—Five Sovereigns.

XV. For the best Ox, calved after 1st January 1836—Ten Sovereigns.

For the second best do.—Five Sovereigns.

XVI. For the best Ox, calved after 1st January 1837—Seven Sovereigns.

For the second best do.—Three Sovereigns.

WEST HIGHLAND BREED.

XVII. For the best Bull, calved after 1st January 1834—Fifteen Sovereigns.

To the *Breeder* of the best Bull in this class—The Honorary Silver Medal.

The same conditions as in Class VII.

XVIII. For the best Cow of any age—Ten Sovereigns.

XIX. For the best Heifer, calved after 1st January 1838—Five Sovereigns.

XX. For the best two Oxen, calved after 1st January 1836—Ten Sovereigns.

XXI. For the best two Oxen, calved after 1st January 1837—Seven Sovereigns.

CROSS BREED.

XXII. For the best two Oxen, first cross between a Short-horned Bull and an Aberdeenshire, Banffshire, Forfarshire, or Kincardineshire Cow, calved after 1st January 1837—Ten Sovereigns.

For the second best two do.—Five Sovereigns.

XXIII. For the best two Oxen, same cross, calved after 1st January 1838—Seven Sovereigns.

For the second best two do.—Five Sovereigns.

XXIV. For the best two Oxen calved after 1st January 1836, a cross between a West Highland Bull, and an Aberdeenshire Horned, or Aberdeen, Angus, or Galloway Polled Cow—Five Sovereigns.

XXV. For the best two Oxen of any cross, except those above specified, calved after 1st January 1836—Ten Sovereigns.

For the second best two ditto—Five Sovereigns.

ANY BREED.

XXVI. For the best Ox, of any breed, showing the most symmetry, fat, and weight, calved after 1st January 1836—Ten Sovereigns.

XXVII. For the best Heifer of any Breed, calved after 1st January 1836, showing symmetry, fat, and weight—Seven Sovereigns.

For the second best do.—Five Sovereigns.

XXVIII. For the best two Oxen, of the Aberdeenshire Horned, or Aberdeen, Angus, or Galloway Polled Breeds, calved after 1st January 1836—Ten Sovereigns.

§ II. HORSES.

Class I. For the best Stallion, for the improvement of the breed of Draught Horses, foaled after 1st January 1830—Fifty Sovereigns.

For the second best do.—Forty-five Sovereigns.

For the third best do.—Forty Sovereigns.

For the fourth best do.—Thirty-five Sovereigns.

The Prize Horses to serve in the four counties, in season 1841, according to the arrangement which may be fixed by the Committee. The number of Mares to be served by each horse not to exceed eighty. The party claiming the service must guarantee to the owner of the horse a payment of Eighty Sovereigns, or One Sovereign for each Mare, and 2s. 6d. to the Groom for each Mare.

II. For the best Breeding Mare, for Agricultural purposes, foaled after 1st January 1828, and having had at least one Foal—Fifteen Sovereigns.

For the second best do. of same age, and having had at least one Foal—Ten Sovereigns.

III. For the best Filly for Agricultural purposes, foaled after 1st January 1838—Eight Sovereigns.

For the second best of same age—Five Sovereigns.

§ III. SHEEP.

BLACK-FACED BREED.

Class I. For the best two Tups, lambed after 1st January 1837—Five Sovereigns.

For the second best do.—Three Sovereigns.

II. For the best pen of Four Ewes, lambed after 1st January 1835, selected from a regular breeding stock of not fewer than one hundred, and the pen having reared Lambs for the season—Five Sovereigns.

For the second best do.—Three Sovereigns.

III. For the best pen of four Wedders, any age.—Five Sovereigns.

LEICESTER BREED.

IV. For the best two Tups, lambed after 1st January 1837—Seven Sovereigns.

For the second best two do.—Three Sovereigns.

V. For the best pen of three Ewes, lambed after 1st January 1837, and having reared Lambs for the season—Five Sovereigns.

VI. For the best pen of three Gimmers—Three Sovereigns.

CHEVIOT BREED.

VII. For the best two Tups, lambed after 1st January 1837—Six Sovereigns.

For the second best—Four Sovereigns.

VIII. For the best pen of three Ewes, lambed after 1st January 1836—Five Sovereigns.

SOUTHDOWN BREED.

IX. For the best Tup, lambed after 1st January 1837—Five Sovereigns.

X. For the best Shearling Tup—Three Sovereigns.

XI. For the best pen of Three Ewes, lambed after 1st January 1837, and having reared Lambs for the season—Five Sovereigns.

XII. For the best pen of three Gimmers—Three Sovereigns.

CROSSES.

XIII. For the best pen of four Wedders, of any cross or age, the cross being specified—Four Sovereigns.

XIV. For the best pen of four Wedders, any age, a cross between a Leicester Tup and Blackfaced Ewe—Four Sovereigns.

Tups to serve in season 1841, in the four Counties, under conditions similar to those above mentioned for Bulls. A guarantee to be given of Ten Sovereigns for the service of each Tup, and the expence of conveyance and keep.

§ IV. SWINE.

Class I.—For the best Boar, farrowed after 1st January 1836—Five Sovereigns.

For the second best do., of same age—Four Sovereigns.

Conditions as to service same as provided in regard to Tups.

II. For the best Sow, farrowed after 1st January 1836—Five Sovereigns.

For the second best do. of same age—Four Sovereigns.

III. For the best three Pigs, farrowed after 1st September 1839—Four Sovereigns.

For the second best do., of same age—Three Sovereigns.

The breed of the Swine to be specified.

§ V. EXTRA STOCK, IMPLEMENTS, ROOTS, AND SEEDS.

For Extra Stock of any kind not shown for any of the above Premiums, and not exceeding in one lot five Cattle, or ten Sheep, and for Implements, Roots, Seeds, &c. Premiums, will be awarded and apportioned by the Committee and Judges, in Money, Plate, or Honorary Medals, to the value in whole of not less than Fifty Sovereigns.

§ VI. WOOL.

1. For the best sample of Combing Wool of seven fleeces—Five Sovereigns.

2. For the best do. of Wool of Sheep of the black-faced breed, of seven fleeces—Five Sovereigns.

> Competitors for these Premiums are required to state the number of Sheep of which the flock consisted, from which the sample is taken, the gross quantity clipped, whether the fleeces are ewe or hog, and, if sold, the price obtained; and in regard to the combing wool, whether it is of the New Leicester, Cotswold, or any cross of these breeds. The Exhibitors must have bred the stock from which the wool has been obtained.

§ VII. DAIRY PRODUCE.

1. CURING BUTTER.

Class I. To the owner of any Dairy in the counties of Aberdeen, Forfar, Kincardine, and Banff, who shall have made and cured and shall exhibit at the Show, the best quality of Butter for the market; the quantity made and cured not being less than two cwt. during the season 1840—Five Sovereigns.

For the second best quality—Three Sovereigns.

A declaration must be lodged with the Secretary, by the party competing, that the sample produced is a fair average of the quality made and cured by the competitors, during the season 1840.

2. MAKING CHEESE.

II. To the person in the said four Counties who shall produce the best specimen of Sweet or Full Milk Cheese, made of any variety that he shall find most profitable for the market, the quantity not being less than one cwt. of 112 lb. 16 oz. to the lb—Five Sovereigns.

For the second best quality—Three Sovereigns.

> The whole quantity of the variety of Cheese produced, made by each Competitor during the season, must not be less than one cwt., and a declaration must be lodged that two or more Cheeses produced are a fair average of the kind competing made in that year by the Competitor.

III. To the owner of any Dairy in the said four Counties who shall have made for sale the best quality of Cheese from Skimmed Milk, not being less than one cwt. during the season 1840—Five Sovereigns.

For the second best quality of ditto—Three Sovereigns.

> These Premiums are offered under the same conditions as the Premiums in Class II.

In the event of two or more lots of Butter or Cheese being deemed of equal merit, the Premiums will be awarde dto the greater quantity.

GENERAL REGULATIONS FOR THE SHOW AT ABERDEEN.

1. The Stock must, at the date of the Competition, be *bona fide* the property and in the possession of the party in whose name they are entered, and they must have been so at least from the 1st of May 1840.

2. In estimating the ages of the Stock, Cattle will be calculated from the 1st of January of the year in which they were calved, Horses from the 1st of May of the year in which they were foaled, and Sheep from the 1st of May of the year in which they were lambed.

3. Cattle fed on distillery or brewers' wash or grains, are excluded from competition, as that food is not generally accessible. Stock which may have received oil-cake or grain, are not excluded; but where cake or grain has been used, the quantities are to be stated in the certificate.

4. Cows in competition must have had a calf, or be in calf in the year 1840. If desired, evidence must be produced that Stallions and Bulls, if four years old or upwards, for which Premiums may be awarded, had produce in the preceding year.

5. An animal having already gained a first premium, at any of the Society's General Shows, is not to be shewn again in competition in a class of a similar denomination, but may be shewn as Extra Stock.

6. The Stock to be shewn must be intimated by a Certificate for each lot, according to the forms hereto annexed. It shall be competent to the Committee, if they see fit, to require the Exhibitor, or the person in charge of the Stock, to confirm the Certificates in the presence of a Magistrate on the day of competition. Printed Certificates, to be completed with the required particulars, and to be subscribed by the Exhibitor, may be had on application at the Society's Hall, Edinburgh; or at Messrs Thomas and Newell Burnett, Belmont Street, Aberdeen. The Certificates, duly completed, must be lodged with the Secretary of the Society, or transmitted, so as to reach him at Aberdeen, or at his office in Edinburgh, at the latest fourteen days before the Exhibition. The Certificates, when lodged, are not to be communicated, except by directions of the Committee. A Competitor may shew more than one lot in any Class, but not more than three. It shall not be competent to enter a lot in one class, and to withdraw it for competition in another, except by authority of the Committee. The same lot can be entered in one Class only.

7. Besides the Stock specified in the Classes of the above list, Cattle, Horses, Sheep, and Swine, possessed of merit, may be exhibited as Extra Stock, if duly intimated by a Certificate for each lot, in a form similar to what is prescribed for the competing Classes, and lodged within fourteen days before the Competition. Stock which cannot be shewn in any competing Class, may be exhibited as Extra Stock. If any lot of Fat Stock, for which a competing Class is open, is to be entered as Extra Stock, from an impression on the part of the Exhibitor that they are too young to compete in the Classes open to them, the Judges of Extra Stock are directed to notice them specially, provided they possess merit. Implements, Seeds, Roots, Plants, &c. must be intimated by lodging with the Secretary, at least six days before the Show, a notice or memorandum specifying the articles, and communicating such particulars regarding them, as the Exhibitors may deem of interest or importance.

8. The Secretary of the Society will be at Aberdeen sixteen days before the Show to receive Certificates, and afford information to intending Competitors. In the mean time, Certificates may be lodged with him at Edinburgh, or with

Messrs Burnett, Aberdeen. A responsible person must attend at the Secretary's office at Aberdeen not later than two days before the Show, to give explanations if required, to receive instructions, and orders duly signed for the admission of the Stock to the Show ground. The person so attending must be acquainted with the various particulars required to be certified.

9. A list of the Stock entered will be made up by the Secretary fourteen days before the Show, and no Stock will be allowed to compete which is not entered in that List.

10. All Stock and other articles entered must be brought forward to the Competition unless prevented by some unavoidable cause. If not so brought forward, the owner will, if a reason, satisfactory to the Chairman of the Committee, or to the Directors, is not assigned, be liable for all expenses caused by the entry of the Stock, and any other course followed which the Committee or Directors may consider proper. The Stock and other articles must be brought to the Show-ground between the hours of six and eight o'clock of the morning of the Show, to afford time for placing them. No Stock whatever can come within the premises without having an admission order. One servant only for each lot can be admitted, and he must continue in charge of the lot in the Show Yard. Bulls must be secured by a ring or screw in the nose, with a chain or rope attached, otherwise they will not be admitted into the Show Yard. There are screws for temporary use, which Competitors will find it convenient to provide for Bulls that have not been usually ringed. The Competing Stock will be distinguished by *numbers*, so that the owner's name will not be known. The names referable to the numbers will be shewn by the List made up by the Secretary.

11. The arrangements for the Show will be conducted by a Committee of the Society's Members. Skilful persons will be appointed to act as Judges, who will be divided into sections to judge of the Classes with which they are best acquainted, in order to render the inspection as short as possible, and that the public may have early access to the Show-ground. The Judges, in forming their opinion, will particularly attend to the instructions hereto annexed.

12. A Member of the Committee, or of the Deputation of Directors, will be appointed to attend each section of the Judges. A servant, provided with tickets upon which shall be printed the Premium awarded, will be in attendance on the Member so appointed; and as soon as a section of the Judges shall determine which animal or animals are entitled to the Prizes in their respective Classes, the Member of the Committee or Deputation of Directors shall direct the servant to affix the Prize Tickets on the animals, and the Member is to be responsible for the Tickets being affixed accordingly, that the public may have the earliest opportunity to examine the points of the Prize Cattle. None of the Tickets so placed shall be removed. If any Prize Ticket be removed and affixed to an animal which has not obtained a Premium, the parties so offending shall be proceeded against as the Committee or Directors may appoint. The Stock shall be withdrawn and the Show-Yard shut at four o'clock.

13. All the Prize Animals shall be brought to the Show-Ground by ten o'clock in the morning of the day immediately after the Show, under penalty of the owner forfeiting the Premiums; when, after an examination by practical judges appointed by the Local Committee, it will be determined what animals shall be claimed to serve in the District, the places of service fixed, and the guarantee given in terms of the Conditions. At the same time, the Deputation of the Directors will determine if Portraits of any of the Prize Animals shall be taken for the Society's Museum, and, in the event of any being selected, the owners are required to keep them in or near the town for such a reasonable time as may be necessary to take the Portrait, under the penalty of forfeiting the Premium

The expense attending the detention, which will be limited to four days, to be paid to the owner by the Society, at a rate not exceeding 7s. 6d. per day. Those who may have Stock possessing particular merit, especially such animals as have been commended by the Judges, are invited to shew them on this day, for the gratification of practical Breeders, when a favourable opportunity may be given to sell both Breeding and Fat Stock to advantage. The Premiums to animals claimed for service will not be paid until 1st September 1841. The other Premiums will be paid with the Society's General Premiums, on or after the 10th of February 1841.

14. No change can, under any circumstances, be made upon the General Regulations established by the Society for Agricultural Meetings and General Shows of Live Stock, so far as Competitors are interested, unless regularly submitted and approved at a meeting of the Directors in Edinburgh, and duly intimated to Competitors.

His Grace the DUKE of SUTHERLAND, President, and the Vice-Presidents of the Society; the Lords-Lieutenant, Vice-Lieutenants, and Conveners of the Counties, with an adequate number of the Members of the Society, to be named at the meetings on the 30th April, by the counties more immediately connected with the Show, together with the Secretaries of the Local Agricultural Associations have been appointed a Committee for regulating all details connected with the Agricultural Meeting and General Show of Live Stock at Aberdeen. The EARL of ABERDEEN, K. T. to be Chairman of the Committee; Robert Grant, Esq. of Tillyfour, Vice-Convener; and in his absence, Alexander Thomson, Esq. of Banchory.

A deputation of the Directors of the Society will be at Aberdeen two days before the meeting.

FORM OF CERTIFICATE APPLICABLE TO FAT OXEN.

I near the post town of , in the county of , do certify, That my Ox (or Oxen, as the case may be), of the breed, to be shewn at the General Show of Live Stock at Aberdeen, for the Premium in class was bred by Mr , of ; he was calved after 1st January 18 , and, calculating from the said 1st January, will, at the date of the Show, be years and months old, and has been fed by me on . The quantity of cake or corn he has consumed has been . He has not at any time been fed on distillery or brewers' wash or grains. He will have to travel on foot (or by steam, or other conveyance, as the case may be) miles, or thereby, from the place of feeding to the Show at Aberdeen. He was first put up to fatten on or about the day of . Witness my hand this day of 1840.

(Signature of the Exhibitor.)

Any observations as to the animal's appearance and state of flesh when put up to feed, or other particulars which the Exhibitor may think material, and more especially the pedigree, may be subjoined to the above certificate.

FORM OF CERTIFICATE APPLICABLE TO CATTLE—LEAN OR BREEDING STOCK.

I of , near , in the county of , do certify, That my , of the breed, to be shewn at the General Show of Live Stock, at , for the Premium in class , bred by , and purchased by me from , on or about , calved after 1st January , and, calculating from the said 1st of January, will, at the date of the Show, be years and months old, and since been in my possession, food been will have to travel on foot miles or thereby, to the Show at Aberdeen. Witness my hand this day of 1840.

(Signature of the Exhibitor.)

N.B.—Any observations, with reference to other particulars which the Exhibitor may think material, may be subjoined to the above certificate. The Pedigree, when known, must also be stated.

FORM OF CERTIFICATE APPLICABLE TO HORSES, SHEEP, OR SWINE.

I , of , near in the county of , do certify, That my , of the breed, to be shewn at the General Show of Live Stock, at for the Premium in class , bred by , and purchased by me from , foaled (lambed, or pigged, as the case may be), after 1st of (June for horses, and May for sheep), and, calculating from said 1st of June (or May), will, at the date of the Show, be years and months old, and since been in my possession, food been , will have to travel on foot miles or thereby, to the Show at Aberdeen. Witness my hand this day of 1840.

(Signature of the Exhibitor.)

N.B.—Any observations, with reference to other particulars which the Exhibitor may think material, may be subjoined to the above certificate. The Pedigree, when known, must also be stated.

INSTRUCTIONS TO THE JUDGES.

1. The Judges will assemble, on the morning of the Show, at the time and place to be appointed by the Commitee. When it is intimated that the Stock is ready to be examined, the Judges will proceed to the respective Classes which have been assigned to them. Without inquiry as to the names of parties or places, they will decide upon the merits of the animals, and their awards shall make reference merely to the *numbers* which distinguish the animals. The Judges will receive from the Secretary blank Reports, to be completed by them with the awards of the Premiums. In this Report, the *numbers* referable to the lots recommended must be distinctly written in words, and not in figures. The Judges will report not only those animals entitled to Premiums, but also the next in merit in each Class, to meet the contingency of any challenge which may be made against the Prize animals. They will also point out any animals, portraits of which they may consider should be taken for the Society's new Museum. They will sign and deliver their Report, and they are not afterwards to propose any change. In the event of a difference of opinion, the majority of the Judges who have examined the Lot shall be conclusive. When the Report is delivered to the Committee, the duty of the Judges shall cease, and the Committee shall award the Premiums.

2. The Judges, in examining the Stock, will proceed on the understanding that the Committee are satisfied with the regularity of the Certificates; but if any of the Stock does not, in their opinion, come within the Regulations, or is of such a character as ought not to be exhibited, they will state their opinion to the Committee, that such course may be adopted as shall appear necessary. Should the Judges desire to have the information communicated in the Certificates, as to the mode of feeding, or other particulars, they will apply for the same to the Committee, through the Secretary.

3. The Judges will have regard to the symmetry, early maturity, purity, size and general qualities characteristic of the breeds of which they judge. They will make due allowance for age, feeding, and other circumstances bearing on the character and condition of the animals. They will not give encouragement for over-fed animals. They will not award Premiums for Bulls, Cows, or Heifers, which shall appear to have been fattened for the butcher, the object being to have superior animals of these descriptions for breeding. In no case shall a Premium be adjudged, unless the Judges shall deem the animals to have sufficient merit; more especially if only one lot is presented for any of the Premiums.

CLASS XI.

GENERAL SHOW OF LIVE STOCK,

AND

AGRICULTURAL MEETING AT BERWICK IN 1841.

The Society having resolved to hold the General Show of Live Stock and Agricultural Meeting for 1841 at Berwick, the following Premiums are offered to be then awarded, aided by liberal donations from the Noblemen, Gentlemen, and Agricultural Associations in the Counties more immediately interested.

§ I. CATTLE.

SHORT-HORN BREED.

Class I.—For the best Bull, calved after 1st January 1837—Fifty Sovereigns.

For the second best do.—Thirty Sovereigns.

To the *Breeder* of the best Bull in this class—The Honorary Silver Medal.

II. For the best Bull, calved after 1st January 1840—Twenty Sovereigns.

III. For the best Cow—Fifteen Sovereigns.

For the second best Cow—Ten Sovereigns.

IV. For the best three Cows—Fifteen Sovereigns.

V. For the best Heifer, calved after 1st January 1839—Ten Sovereigns.

For the second best do.—Seven Sovereigns.

For the third best do.—Five Sovereigns.

VI. For the best Heifer, calved after 1st January 1840—Ten Sovereigns.

For the second best do.—Five Sovereigns.

VII. For the best three Heifers, calved after 1st January 1839—Fifteen Sovereigns.

VIII. For the best two Oxen, calved 1st January 1838—Twelve Sovereigns.

For the second best two ditto—Eight Sovereigns.

IX. For the best two Oxen, calved after 1st January 1839—Twelve Sovereigns.

For the second best two do.—Eight Sovereigns.

GALLOWAY, ANGUS, AND ABERDEEN POLLED BREEDS.

X. For the best two Oxen, calved after 1st January 1837—Fifteen Sovereigns.

For the second best two do.—Ten Sovereigns.

AYRSHIRE BREED.

XI. For the best Cow—Ten Sovereigns.

For the second best ditto—Five Sovereigns.

WEST HIGHLAND BREED.

XII. For the best two Oxen, calved after 1st January 1837—Fifteen Sovereigns.

For the second best two do.—Ten Sovereigns.

XIII. For the best two Oxen, calved after 1st January 1839—Bred by the Exhibitor, never housed—Ten Sovereigns.

XIV. For the best two Cows—Ten Sovereigns.

ANY BREED.

XV. For the best two Oxen, pure or crossed, calved after 1st January 1837—Fifteen Sovereigns.

XVI. To the Owners of the five best Steers, calved after 1st January 1840, which, in the opinion of the Judges, will best remunerate the feeder—Fifteen Sovereigns.

XVII. To the Owners of the five best Heifers, calved after Ist January 1840, which, in the opinion of the Judges, will best remunerate the feeder—Fifteen Sovereigns.

§ II. HORSES.

I. For the best Cart Stallion, not exceeding eight years—Fifty Sovereigns.

For the second best do.—Twenty-five Sovereigns.

For the third best do.—Fifteen Sovereigns.

II. For the best thorough-bred Stallion—Twenty Sovereigns.

The Prize Horses to serve in season 1842, according to the arrangement which may be fixed by the Committee. The number of Mares to be served by each horse not to exceed eighty. The party claiming the service must guarantee to the Owner of the Horse a payment of Eighty Sovereigns, or One Sovereign for each Mare, and 2s. 6d. to the Groom for each Mare.

III. For the best Cart Mare—Fifteen Sovereigns.

For the second best do.—Ten Sovereigns.

IV. For the best Mare for breeding Hunters—Ten Sovereigns.

V. For the best Filly or Colt for agricultural purposes, foaled after 1st January 1838—Five Sovereigns.

VI. For the best do. foaled after 1st January 1839—Four Sovereigns.

VII. For the best do. foaled after 1st January 1840—Three Sovereigns.

§ III. SHEEP.

LEICESTER BREED.

Class I.—For the best Tup—Twenty Sovereigns.
For the second best do.—Fifteen Sovereigns.
For the third best do.—Ten Sovereigns.

II. For the best shearling Tup—Twenty Sovereigns.
For the second best do.—Fifteen Sovereigns.
For the third best do.—Ten Sovereigns.

III. For the best pen of five Ewes—Ten Sovereigns.
For the second best do.—Five Sovereigns.

IV. For the best pen of five Gimmers—Ten Sovereigns.
For the second best do.—Five Sovereigns.

V. For the best pen of five Dinmonts—Five Sovereigns.

CHEVIOT BREED.

VI. For the best three Tups—Fifteen Sovereigns.
For the second best three do.—Ten Sovereigns.

VII. For the best three shearling Tups—Ten Sovereigns.
For the second best three do.—Five Sovereigns.

VIII. For the best pen of ten Ewes—Ten Sovereigns.
For the second best ten do.—Five Sovereigns.

IX. For the best pen of ten Gimmers—Ten Sovereigns.
For the second best ten do.—Five Sovereigns.

X. For the best ten fat Wedders, lambed in 1838—Five Sovereigns.

BLACK-FACED BREED.

XI. For the best three Tups—Ten Sovereigns.

XII. For the best pen of ten Ewes—Five Sovereigns.

XIII. For the best ten fat Wedders, lambed in 1838—Five Sovereigns.

SOUTHDOWN BREED.

XIV. For the best Tup—Ten Sovereigns.

XV. For the best pen of five Ewes—Five Sovereigns.

CROSSES.

XVI. For the best pen of five Dinmonts, cross between Leicester Tup and Cheviot Ewe—Five Sovereigns.

XVII. For the best pen of five do., cross between Leicester Tup and Black-faced Ewe—Five Sovereigns.

XVIII. For the best pen of five Wedders, of any cross and age—Five Sovereigns.

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§ IV. SWINE.

I. For the best Boar—Five Sovereigns.
For the second best do.—Four Sovereigns.
II. For the best Sow—Five Sovereigns.
For the second best do.—Four Sovereigns.

§ EXTRA STOCK, IMPLEMENTS, ROOTS, AND SEEDS.

For Extra Stock of any kind not shewn for any of the above Premiums, and not exceeding in one lot five Cattle or ten Sheep, and for Implements, Roots, Seeds, &c. Premiums will be awarded and apportioned by the Committee and Judges, in Money, Plate, or Honorary Medals, to the value in whole of not less than Fifty Sovereigns.

GENERAL REGULATIONS FOR THE SHOW AT BERWICK.

1. The Competition will take place at Berwick in the end of September, or beginning of October, 1841. The particular day will be afterwards intimated. The Competition will be open to Stock from any part of the United Kingdom.

2. The name, residence, and post-town of the Exhibitor, the name of the Breed, the number of the Class in which the animals are to be exhibited, their age, and, in the case of Fat Stock, the kind of food on which they have been fed, must be regularly certified. Forms of the necessary Certificates, and information as to the period when they fall to be lodged, will in due time be furnished.

3. It is required, that the Stock shall have been *bona fide* the property, and in the possession of the Exhibitor, from 1st May of the year in which the Show is to be held. Evidence must be produced, if desired, that the Stallions and Bulls for which Premiums are awarded have had produce during the preceding year, provided they are four years old and upwards.

4. No Cattle fed on distillery or brewer's wash or grains (which are accessible to a few Competitors only) will be allowed to compete. Cows exhibited for Premiums must have had a Calf, or be in Calf during the year of the Show, Feeding on oil-cake or grain is not excluded; but, if used, the quantity to be specified.

5. The distance each animal travels to the Show, and, in the case of Fat Stock. the date of being put to fatten, to be mentioned.

6. A Competitor may shew more than one Lot in any Class. It shall not be competent to enter a Lot in one Class, and afterwards to withdraw it for competition in another Class, unless by the directions of the Committee. An animal having already gained the first Premium in its Class, at any of the Society's General Shows of Stock, is not to be shewn again in competition in a Class of the same denomination, but may be exhibited as Extra Stock.

7. Stock, which cannot be shewn in any competing Class, may be exhibited as Extra Stock. If any Lot of Fat Stock, for which a competing Class is open, is to be entered as Extra Stock, from an impression on the part of the Exhibitor that they are too young to compete in the Classes open to them, the Judges of Extra Stock will be directed to notice them specially, provided they possess merit.

8. The Judges will be instructed not to award Premiums to Cows, Bulls, or other Breeding Stock, which shall appear to have been fattened for the butcher;

the object being to encourage such Stock for the purpose of breeding. They will also be instructed to discourage overfed animals.

9. The other Regulations referable to General Shows will be published in due time for the information of Competitors. In the mean time, intending Competitors are referred to those published for the Aberdeen Meeting in 1840. The Male Stock shewn at Berwick, with the exception of Stallions, will not be required to serve in the District.

THE VETERINARY SCHOOL.

This Establishment is conducted under the superintendence of Mr Dick, Veterinary Surgeon, the Lecturer appointed by the Society. Students receive instruction in the anatomy and diseases of the horse and other domestic animals, in the best system of treatment and cure, in stable management, and in the most approved and scientific modes of shoeing. The Students are sent to the Class by Local Agricultural Associations, or attend on their own account. The hour of lecture is accommodated to the convenience of Students attending the Agricultural and other classes in the University. Those Students who attend two courses, and are afterwards found qualified at the Annual Examination by the Committee of Medical Examinators, receive certificates. Graduates of the School under the Society's patronage are now eligible for Veterinary Surgeons in the Army and East India Company's service.

Mr Dick occasionally delivers a popular course of Lectures to a class of Gentlemen. It may be also observed, that several of the principal Lecturers in different branches of Medical Science, have for some years given free admission to their classes to those Veterinary Students who intend to practice.

The Lectures and Demonstrations for the Session 1841-42, will be commenced in November next, at the Lecture-room in Clyde Street, Edinburgh.

By order of the Directors,
CHARLES GORDON, *Secretary*.

UNIVERSITY OF MICHIGAN
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